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Radio by Wire

Use of Electricity Supply Mains

THE intention of the Postmaster-General to establish a broadcast radio relay system is being proceeded with at a faster rate and on a much broader basis than originally expected. No longer is it the concern merely of the Post Office and existing radio relay exchange organisations; the B.B.C. and a number of Government Ministries are directly involved, for the P.M.G. has stated in the House of Commons that "national defence and safety have been the main considerations in the new arrangements" as they are now being termed.

This aspect of the matter shows up the wisdom of seeking for a "second line" of communication to serve as a safeguard against the possibility of B.B.C. effectiveness being reduced by external intervention, or interference, or overburdening in times of stress by duties additional to its normal work of entertainment. And it is logical to couple with defensive prudence an effort to ensure, so far as is possible, that the alternative means to be adopted shall not indiscriminately radiate to unauthorised listeners information which is not intended for them.

Safety and secrecy requirements could reasonably be satisfied by the employment of networks of underground cables. Additionally, buried cables could be linked up or isolated as and when it might be desired to communicate simultaneously with the whole civil population or in zone-sequence with particular communities.

Wider Scope

Much has transpired since the P.M.G. announced in the House of Commons that the new service would be restricted "at first" to telephone subscribers. While it is conceivable that he may persist in his earlier endeavour in order perhaps to establish some prior right, telephone subscribers represent so much smaller a number of households than does the total of radio receiving licence holders. Extension of any wire relay service by laying additional cables solely for that purpose would be a lengthy and costly procedure, whereas the utilisation of existing electricity supply mains as relay networks would enable many more households to be connected relatively quickly and less expensively, including the very large number of poorer dwellings in which electricity is used, but certainly not the telephone.

To what extent can this proposal be carried into effect? It is plainly at present contrary to the terms of the earlier Electric Lighting Acts which, in defining the powers, duties and obligations of authorised electricity undertakers, particularly exclude "the transmission of any telegram," the interpretation of which expression according to the Telegraph Acts is all-embracing. But this obstacle can be removed by the introduction of a one-clause Bill, simple enough for Parliamentary procedure to permit its passage to be expedited if necessary, notwithstanding the possibility of a general election being decided upon in the autumn.

Possibilities under Discussion

Such enabling legislation will allow the electricity supply industry to co-operate, as it is expected to do, in a scheme that is believed to be sound in principle. Consultations are proceeding between the Post Office, the Electricity Commissioners and electricity supply associations; the power companies seem to have been quick to appraise the possibilities of the scheme, and there is no very good reason to suppose that the municipalities will finally arrive at a conclusion that is very different.

It may be anticipated that royalty payments, or some similar form of reimbursement, will be offered to owners of mains and cables utilised for "re-diffusion" purposes. Mention of this word recalls the Eckersley-British Insulated Cables demonstration at Liverpool on the occasion of the 1934 I.M.E.A. Convention. Incidentally it also prompts reflection upon the privileged position in which the possessors of certain patents may find themselves.

Apart, however, from making their cables available, cable owners are not likely to have anything to do with the provision of programme matter, or its injection into the distributing lines. This will more probably be the function of "special companies" formed for the purpose under licence from the P.M.G., programmes being taken on the terms at present available to relay exchanges. In this connection it should be observed that Part VII of the Middlesbrough Corporation Bill of 1933, which unsuccessfully sought to establish and maintain a local municipal wireless exchange, and to broadcast programmes by re-diffusion, was deleted for reasons which might very well to-day have Ministerial backing consequent upon the need for precautionary alertness—and it will be some time before tension

will wane sufficiently to permit of any relaxation of preparedness.

At the beginning, suppliers of electricity may suffer a diminution of energy consumption by reason of the fact that a simpler type of reproducer would suffice under the new conditions for purely local reception, but the simpler instrument should quicken listeners' interest in the use of several sets in the home, so that in time more of them will be employed. The demand for receivers as we know them now will probably remain unaffected, for most listeners will want more choice than the programmes relayed to them. The convenience and versatility of combination or multi-purpose sets will continue to offer plenty of scope for development.

A Good Start

IT has been said, with somewhat obvious truth, that the best way to ensure successful marriage is to start right. This, among other things, should mean that the bride should have the most efficient and up-to-date arrangements in her new establishment. No doubt it is this consideration, as well as the desire to improve its summer load curve, which has prompted the Prague supply undertaking to offer three months' supply of electricity free of charge to those who marry in the summer months. Whatever the motive behind it may be, the move is a good one and should bring in a good future return.

Street Lighting Costs

COMPARING the cost of electricity and gas for street lighting in Liverpool, Mr. P. J. Robinson, city lighting engineer, shows that electricity is 54 per cent. cheaper. This is on the basis of cost per candle-power per annum, which he considers is the most equitable manner at the moment of comparing the values of street lighting, due regard being paid to its application. For electricity the figure is 1.752d. and for gas 3.856d. In addition, he points out that the operating costs of modern electric street lighting installations are 25 per cent. less than with the most efficient gas lighting. An appreciable proportion of the street lighting in the area is still by gas lamps, of which there are 15,181 compared with the 17,984 electric lamps, and the costs quoted should induce an acceleration in the rate of conversion.

Glasgow and E.D.A.

THERE is a feeling in Glasgow that they are not getting full value for the £1,400 or so which they subscribe to the funds of the British Electrical Development Association. The Electricity Sub-Committee on Finance and Works recommended recently that the Corporation should withdraw from membership of the Association, but the Electricity Committee decided to defer action until it had discussed the position with representatives of E.D.A. Whether the attitude taken up is justified may be questioned. In the first place Glasgow has access to all the services available to members of the Association, which most undertakings recognise as being of considerable assistance. Referring to the last annual report of E.D.A. for particular references to Glasgow, we find that during 1938 advertising in connection with the Domestic Electrification Campaign appeared regularly in five provincial newspapers (apart from the national and magazine press), and two of these were Glasgow journals. At the Empire Exhibition, Glasgow, which ran for six months, the Association organised an electrical pavilion at which 10,000 inquiries were dealt with (a large proportion no doubt from Glasgow citizens). In November, a new Building Centre was opened in the city, with an electrical section for which E.D.A. was responsible. It can safely be said therefore, that Glasgow seems to have got a pretty fair return for its money, and we hope that it will not withdraw its powerful support from the Association without very serious further consideration.

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The Far East

THE clouds which have gathered over the British concessions in China during the last year or so have not daunted the General Electric Co. of China, Ltd. (a branch of the English G.E.C.). The company's faith in the future of British electrical trade in the Far East is manifested by the splendid new headquarters which it has erected in Shanghai, some illustrated details of which appear in this issue. We must say that when we received the information, after reading of recent events in China, it came as a ray of sunshine. There are still gleams of hope in the situation. Readers will remember Dr. Middleton Smith's recent article on the prospects for British trade in China, which showed that foreign assistance, other than Japan's, in the development of the country would be necessary for many years yet.

Power Station Site Problem

HOWEVER eloquent people may be in their claims for a right to participate in the benefits of electricity, they are not in the least anxious to have the source of power in their midst. At least, that is the experience of the North-West Midlands Joint Electricity Authority. After a lengthy inquiry its application to establish a power station at Barlaston, strenuously objected to by the residents, was rejected by the Electricity Commissioners. Last week a local paper stated that the J.E.A. was considering a site at Newstead, Trentham, which immediately provoked a number of residents to send in a protest. At a recent meeting of the Stoke-on-Trent Council, Alderman S. Walker said that if a site was not found it would be disastrous for the district, as they would have to pay the standard grid tariff. As far as 1943 was concerned that would mean an extra £95,000, and the amount would grow, while the scheme meant much to local colliery owners and traders generally.

Welding Symbols

THE approved method of indicating welds on drawings has been greatly simplified by the issue of a revised British Standard, which is likely to be of much more practical use to the industry than was the old system. Modifications to the symbols are mainly with regard to the form in which the various welds are defined in the glossary, alterations in the definitions themselves being relatively small. While the change over from one system to the other will, no doubt, cause some temporary inconvenience, it should be well worth doing. In some cases it will be necessary; the L.C.C., for example, requires symbols on drawings submitted to it for approval to be in accordance with the British Standard.

Motors and Their Application

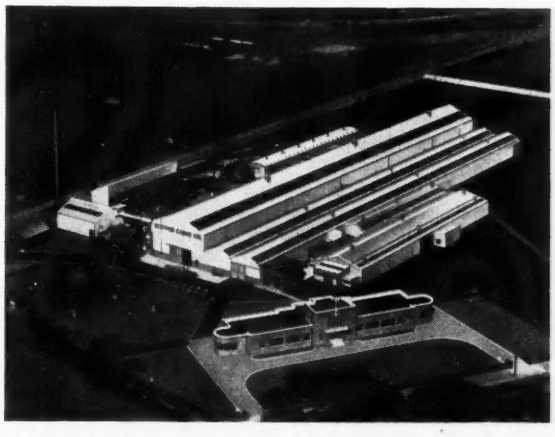
THIS issue contains the first of the series of articles on the design and application of motors for many purposes written as a result of an extensive and intensive investigation of the subject. Next week's article will deal with performance, group and individual drives, and the elimination of noise.

CABLE MAKING IN SCOTLAND

New Industry at Renfrew

ONE of the most important recent industrial developments in the West of Scotland has been the establishment of the new works of Scottish Cables, Ltd., at Renfrew. This new company was formed as the result of collaboration with the Commissioner for the Special Areas and other industrial bodies, the objects being to erect works in one of the Special Areas in Scotland for the manufacture of electric cables with a view primarily to assisting in the relief of unemployment. We understand that prior to the formation of this company, a large proportion of the electric power cables used in Scotland was purchased from abroad, and it is interesting and encouraging to note that since going into production, Scottish Cables, Ltd., has been successful in securing a considerable amount of this business.

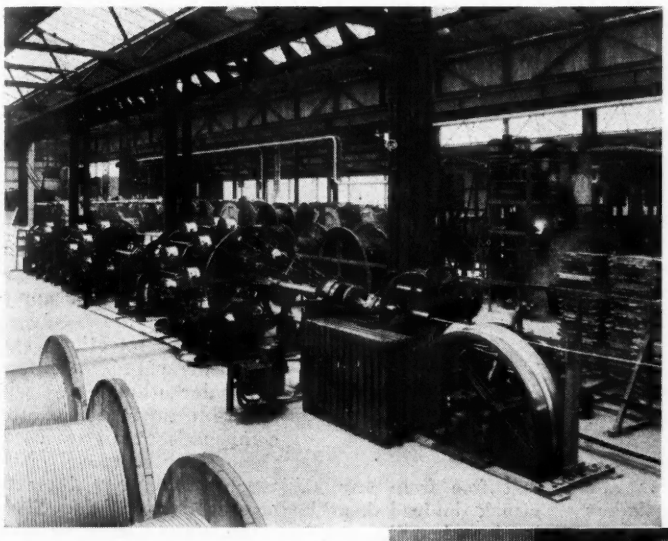
The rapidity with which the factory has been put into operation is remarkable. In October, 1937, the first of the steel girders was delivered into a green field, but by June, 1938, all the main constructional work had been completed and production had been commenced. Since then the output of the factory has risen rapidly and the company is already employing several hundred people who would otherwise be out of work. Quick delivery is a special feature of the company's endeavours and in this it is much assisted by the situation of the factory which, besides having its own private railway siding, is only a very short distance from the Clyde, and has its frontage on the main Glasgow-Renfrew arterial road.

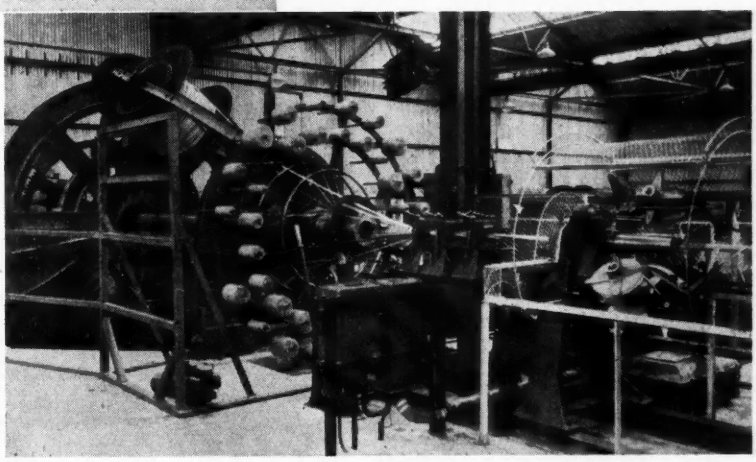


Aerial view of the factory of Scottish Cables, Ltd.

In designing the factory, an eye has been kept on the future. Although the present floor area is about 130,000 sq. ft., the area of the site is 17½ acres, and the company has the option of further adjacent land if required. So as not to hamper future extensions, all auxiliary sections of the works, such as the boiler house, carpenter's and engineer's shops, garages, etc., have been built separately away from the main buildings.

When we visited the factory recently, we had the opportunity of examining the various manufacturing processes from the entry of the raw materials to the despatching of the finished products. Samples of all incoming goods are tested in the very fully equipped and staffed laboratories and must be approved before being passed to the shops for use. The "straight line" method of production has been adopted so as to ensure a continuous progressive flow of work along an uninterrupted production line, at the end of which the cables are completed and ready for testing and despatch.





37-wire stranding machine and (right) large laying-up machine

The copper for the cable conductors arrives at the factory as pure electrolytic copper rod, and before it is passed to the wire-drawing section it is pickled so as to remove all traces of oxidised matter from the surface.

Several different types of wire-drawing machines are installed so that wires from the largest sizes used for overhead transmission lines down to the smallest instrument wires can be produced. The drawing of cadmium-copper wires is also provided for. The bare wires are generally supplied in the hard-drawn condition, and it is necessary to soften the copper before it can be made into cable conductors, and this is done by the latest form of dry annealing plant. The process consists of heating the coils of wire to a suitable temperature in a non-oxidising atmosphere by means of an automatically controlled electric furnace. The plant is said to represent a great advance over older types, as accurate control of the degree of annealing is made possible.

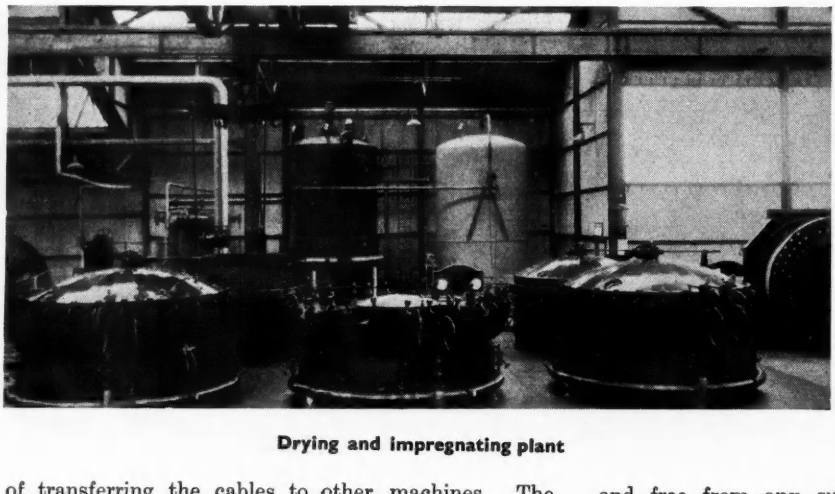
Samples of wire are taken from every batch of copper passing through the plant and are checked for physical and electrical characteristics.

The annealed copper wire is wound on steel bobbins by means of a battery of semi-automatic winding machines, the length of the wire being measured at the same time. In the stranding section numerous machines are installed capable of producing all sizes of cable conductors at present in use. The machines are fitted with the latest type of preshaping and prespiralling equipment.

The chemically pure insulating paper arrives at the factory in rolls up to 36 in. wide and is slit into tapes of the required width. Several different types of paper lapping machines are installed to cater for all classes and sizes of conductors. These machines are of the most modern type and each one is specially designed for the particular class of cables it is intended to deal with. The largest machines are of the high precision tangential type and are capable of insulating all voltages of power cables up to and including 33,000V.

Laying-up

After insulating, the cores are laid up or twisted together by means of large laying-up machines, several different types of which are installed. These machines are complete with all the necessary auxiliary equipment to ensure that the cables are accurately assembled and that the orientation of shaped cores is correct. All of the laying-up machines are equipped with precision type paper lapping heads in order that, after the cores are laid up and padded circular with wormings of jute yarn or paper, a further belt of insulating paper can be applied without the necessity of transferring the cables to other machines. The cables are then wound on to large perforated cylinders which are placed by means of overhead cranes into the impregnating vessels.

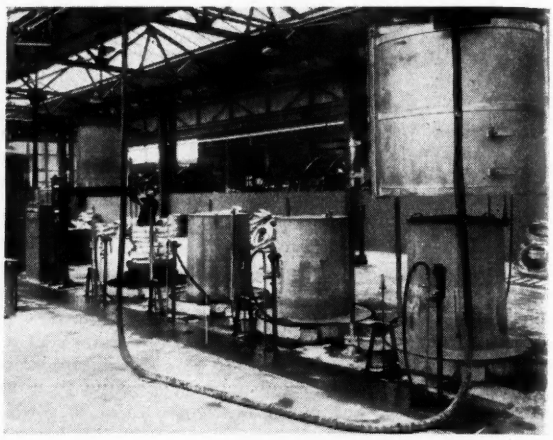


Drying and impregnating plant

The drying and impregnating plant is one of the most important and complicated parts of the entire equipment of the factory and has been specially designed and laid out so as to ensure that the process is carried out in the most efficient manner possible, and in accordance with the latest scientific development. After heating to a suitable temperature, the impregnating vessels are evacuated and precautions are taken to ensure that the cables are thoroughly dried throughout their length and that the residual atmosphere within the vessels is reduced to the lowest possible value prior to impregnating.

While the cables are being dried and evacuated, the impregnating compound is treated in a separate section of the plant where it is dried and thoroughly de-gasified. After drying, the cables are impregnated under pressure at a high temperature and are carefully cooled before being removed from the impregnating vessels and transferred to the lead covering section.

The lead presses are specially constructed to prevent any possibility of lead faults such as were common with older designs of presses. The die boxes are electrically heated and a special arrangement (patented by Scottish Cables, Ltd.) is provided for ensuring that the cables are accurately guided through the presses. The temperature of the die boxes and of the lead or lead alloy is measured by means of Cambridge indicators. On leaving the lead presses the cables are coated with a special compound which is designed to eliminate the possibility of corrosion of the sheathing after being put into service.



Section of the dry annealing plant

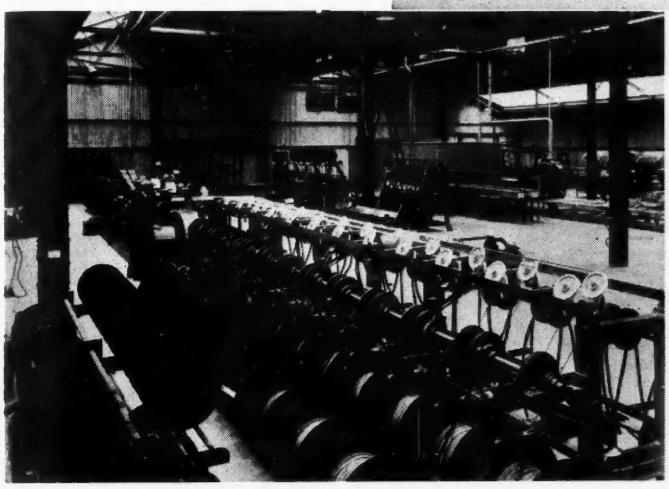
The cables are next passed to the armouring section where a number of different types of armouring machines are arranged so as to be capable of applying any of the standard types of protection and armouring at present in use. Particular attention is paid to the composition of the compounds which are used, these being chemically pure and free from any substances which are likely to attack the lead sheathing or armouring metals. Plant has been installed for the vacuum drying and impregnation of the fibrous materials used for beddings and servings such as paper, cotton, jute yarn and hessian cloth. The jointing of steel tapes and wires is carried out by means of electric welders.

Lead presses have their die boxes electrically heated

All cables are tested to the relevant B.S. Specifica-

tions or to customers' special requirements in a well-equipped electrical test department. Great care has been exercised in the design of the high-voltage testing plant to avoid any possibility of danger to the operators, the cables under test being enclosed by an earthed metallic fencing. The gates into the enclosures are electrically interlocked with the high-voltage apparatus so that it is impossible to switch on unless they are closed and locked. As a further precaution, it is impossible to close the main switches unless the regulators are in the zero voltage position. Several high-voltage testing sets are installed to deal with cables up to and including 33-kV, voltage control being by means of both induction and moving-coil regulators.

A high-voltage Schering bridge is included in the equipment for dielectric loss measurement. In addition to over-potential tests, various testing sets are available for the measurement of dielectric resistance, electrostatic capacitance and conductor resistance. Furthermore, all cables are carefully checked for size and general construction so as to ensure compliance with the manufacturing specifications before being capped and packed ready for despatch.



Line of braiding machines and (left) 24-wire longitudinal rubber covering machine in the rubber cable section

Rubber Insulated Cables

An entirely separate section of the factory is devoted to the manufacture of rubber insulated cables. The first process we examined, and one of the most vital, was the tinning of the copper wire. Great care has been taken in the design of this plant and in the arrangements which have been made for the treatment of the wire so as to ensure that it is chemically clean and the coating absolutely continuous throughout its length. Frequent samples of tinned copper wire are tested in the chemical laboratory to ensure the maintenance of quality.

Large duplicate mixers are installed in which the various compounding ingredients are mixed with the raw rubber, after which the compound is passed to forcing machines or alternatively, after calendering, is the slit into suitable widths and passed to the longitudinal covering or to the lapping machines.

The actual method that is adopted for applying the rubber insulation to the conductors of any particular type of cable depends upon its size and general design, and while in accordance with the latest British Standard Specification for rubber insulated cables the insulation of standard sizes may be applied in two layers, a three-layer construction has been adopted throughout with a view to ensuring a very high factor of safety.

After insulating, the core is usually covered with a proofed cotton tape and the cable is then wound on to large cylinders which are run into a vulcanising chamber where the insulation is vulcanised at a high temperature, the whole of the process being automatically controlled. After curing, small cables are usually covered with a cotton braid and subsequently impregnated with a suitable preservative compound or, alternatively, they may be sheathed with a special lead alloy or with a tough rubber compound.

Dry Spark Tester

Included in the testing equipment for rubber insulated cables is a dry spark tester by means of which it is possible to test all small and medium size rubber insulated cables without the necessity of immersing them in water. This alternative method of testing rubber insulated cables is provided for in the latest British Standard Specification and has the great advantage that it eliminates any possibility of trouble arising as the result of the insulation coming into contact with water.

After completion of manufacture and testing, the rubber insulated cables are wound on suitable drums, sealed and packed for despatch.

A general view of the factory

We wish to express our thanks for the courtesy extended to our representative by Mr. William Fraser, M.I.E.E., chairman and managing director of the company, and to Mr. J. S. Hastie, technical manager, who showed him over the works.

SUB-STATION PLANNING

Anticipating Load Growth

By B. Nuttall, A.M.I.E.E.

A CAREFUL study of a city's high-voltage distribution network diagram which indicates the maximum kVA loading at the key sub-stations, in conjunction with maps showing the cable routes, will enable major developments on the system to be forecast with a fair degree of accuracy for several years ahead.

The distribution engineer is assumed to be thoroughly acquainted with the industrial and domestic areas within the electrical boundaries of the supply authority, including the

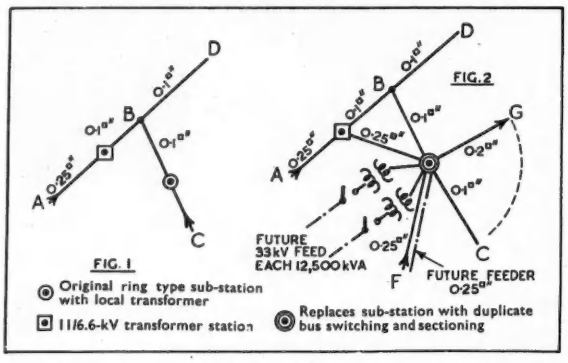


FIG. 1
FIG. 2
FUTURE 33kV FEED EACH 12,500 kVA
FUTURE FEEDER
Original ring type sub-station with local transformer
11/6.6-kV transformer station
Replaces sub-station with duplicate bus switching and sectioning

Figs. 1 and 2.—Example of the planning and growth of a main switching station. In Fig. 2 the local 11/0.4-kV transformer is omitted for clearness

private industrial installations, especially those of antiquated design, and other potential loads such as collieries, quarries and gravel pits.

Another thing that is essential is to indicate also on the appropriate map the town-planning schemes of all authorities concerned and in the case of housing estates to ascertain the approximate number of houses and assess a total kilowatt loading over a period of seven to ten years based on similar types of property.

With this information available the position of probable sites can be ascertained. Broadly speaking, there are three classes of sub-station, the purpose for which they are to be

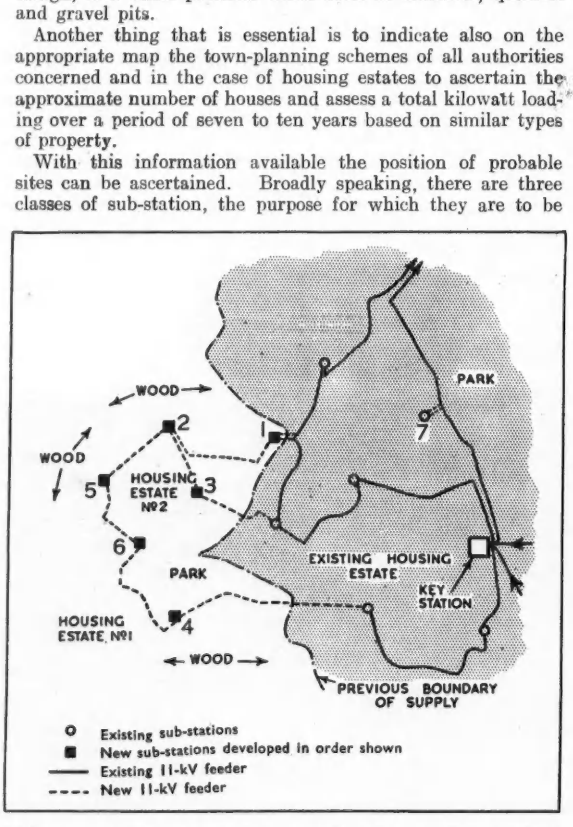


Diagram showing the sequence of development in a typical urban housing estate over a period of two years

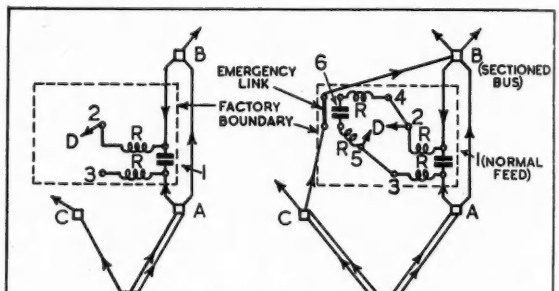
used having a direct bearing on their positions. These are dealt with below :—

"Key" or main sub-stations.—These, as their name implies, are the major switching, transforming or converting points, or a combination of any of them. For a switching or convertor station the site chosen will be as near as practicable to the confluence of the existing cable network, if any.

Usually such stations involve transformation and redistribution at high-voltage so that for a new area or for the first stages in the permeation of a dense DC network, prior to its gradual elimination, a fair amount of latitude may be exercised as voltage drop is not in this case a vital matter. Other considerations become more prominent, such as cost of land due to the considerable area often involved, transformer hum and the frequently encountered unwillingness of landowners to allow strategic sites to be utilised.

Industrial or bulk supply sub-stations.—In the majority of cases industrial concerns are fed by a single sub-station, the position of which is often determined to suit the consumer's convenience. Much tact on the part of the supply authority's officials is frequently required to persuade the customer to give adequate accommodation, especially if he has been used to a DC supply.

It is sometimes expedient for the undertaking to offer special terms or to pay a nominal rent for the privilege of utilising such a sub-station for outside (*i.e.*, public) supply, especially if it enables isolated low-voltage networks to be



Example of planned industrial system development, showing initial (Fig. 3) and ultimate (Fig. 4). In Fig. 3 the remaining load is supplied from private plant

1 and 6.—Main supply stations with remote control panels for closing and tripping.
6.—Duplicate bus switching to enable C normally to feed B independently of works system.
2-5.—Works sub-stations (hand control).
R.—Reactors reducing from 500 to 150 MVA.
D.—Two-wire rectifiers.

coupled or is in the city centre where accommodation is at a premium. In practice this arrangement works extremely well.

A survey of a large consumer's requirements, based on similar methods used on the supply authority's network, will often enable an ordered and economical scheme to be applied involving high-voltage distribution round the factory with several "ring" type sub-stations at the most advantageous points. In such cases the intake sub-station is little more than a main switching point and where justified two such stations may be installed, preferably at opposite ends of the factory. This, of course, is vital for steelworks, armament factories and the like.

Public or domestic sub-stations.—As these transform down direct to give 400/230-V four-wire supplies, their position is fixed within narrow limits, being largely determined by the load, *i.e.*, voltage drop along the distributors to the furthest point on the low-voltage system. Many sites for this class of sub-station can be predetermined and acquired, being developed as the load justifies it. If left until the existing station is nearing its capacity it is seldom that the most desirable position can be obtained, with the result that greater expenditure on cables and land is entailed, the increased cost often exceeding the cost of land plus building if purchased earlier.

Such planning will often result in a more direct run of high-voltage cable and in certain cases where sites are awaiting development, as on new estates, further economy will automatically be made through timed co-operation with the Highway Department in the laying and reinstatement of both high- and low-voltage cables.

Motor Survey—I

Manufacturer and User

Co-ordinating Varying Requirements

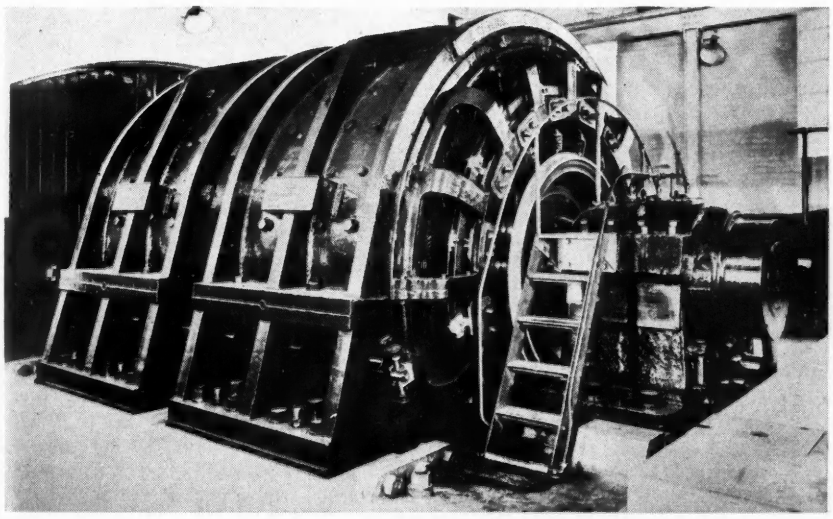
DURING an intensive and lengthy investigation into the application aspects of electric motor developments the smallest and largest motors we have come across are a 1/250th-HP shaded-pole induction unit listed by Batwin Electric Motors and a 20,000-HP DC reversing motor built by the General Electric Co., Ltd., and driving a cogging mill at the Cleveland steelworks.

It would take the space of this first article merely to name the enormous number of different types of machines available between these limits, so it is not very surprising to find that a good deal of confusion exists as to what is the most suitable motor for a particular set of duties, and this confirms our conviction, arising from inspections of numerous industrial installations over many years, that much good could result from a survey such as we are now attempting.

In this, the first article of the series announced last week, we consider the difficulties which face the electric motor manufacturer in meeting the requirements of various kinds of drive, and the works engineer or consumer in making the correct choice for his particular job. These difficulties have led to the demand for and supply of the motor for all purposes.

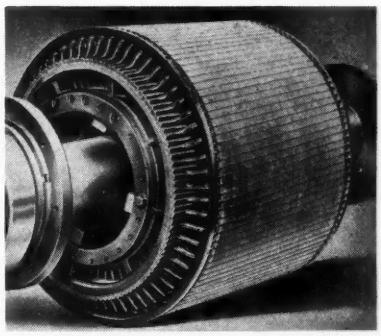
To indicate a few of the difficulties of the manufacturer, Mr. Nixon, of the Brush Electrical Engineering Co., Ltd., spoke of the considerable ignorance he had found of the real factors which bear upon the characteristics of the motor; Mr. Davey (Croydon Engineering Co., Ltd.) told us that one of his greatest difficulties was to find out what torque was required for a particular drive; and Mr. Hitching (Brittain's Electric Motor Co.), in calling for greater co-operation between manufacturer, supplier and user, quoted cases in which he had been asked for 50 per cent. speed variation, to find out later that only 10 per cent. was required.

Mr. Youngmark, of the English Electric Co., Ltd., told us that many large firms simply specify rating and temperature rise, and he feels that modern industry tends to put too much responsibility on the buyer with little or no technical knowledge. Mr. Hoseason (Metropolitan-Vickers Electrical Co., Ltd.), showed how necessary it is to appreciate the difference between motors and other equipment in service (turbo-alternators and transformers, for instance, have special buildings and skilled attendance, while motors have to adapt themselves to all the conditions of the various industries) and at a conference with engineers of the British Thomson-Houston Co., Ltd., the importance of aiming at the minimum of servicing was stressed.



The largest motor encountered ; a 20,000-HP, DC reversing motor (G.E.C.) driving a cogging mill at the Cleveland steelworks

Following the steam drive the motor had made things easier in the factory; the modern motor must not make them more difficult again. The guiding principle in mechanical design to-day is what is going to happen to the motor in service, but Mr. Bailey (Bruce Peebles & Co., Ltd.) pointed out how difficult it is with the enormous number of applications to lay down a general rule as to the degree of mechanical protection necessary. With a bearing on the relationship between mechanical construction and electrical design which, said Mr. Hoseason, are fixed by the industry and the driving characteristics, respectively, Mr. Schulthess (British Brown-Boveri, Ltd.) emphasised the difficulty: the greater the protection afforded the more cooling is impaired, so that a bigger motor becomes necessary. The electrical design, of course, is largely dictated by the driving torque, and commenting on this the Brush Co. expressed that if a motor is not correctly applied with regard to its torque features the result can be jerky starting, excessive current consumption or unduly rapid acceleration with consequent wear on the power transmission medium.



The " Low Current " (Laurence, Scott) motor is regarded as a " modified general purpose " machine; completed rotor

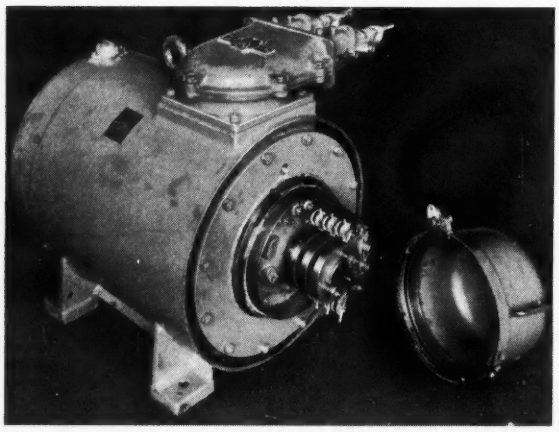
Another difficulty for both manufacturer and user, with a particular bearing on torque requirements, is the supply limitations with regard to direct switching of s.c. motors. This difficulty is resulting in a good deal of dissatisfaction because of the wide divergence of views among supply undertakings. Some put the limit as low as 1 HP, while there appear to be identical undertakings which allow up to 30 HP. Commenting on their "Low Current" high-torque motor, Laurence, Scott & Electromotors, Ltd., say "there is no doubt that these machines have a big future, especially if supply undertakings relax their somewhat unnecessarily severe restrictions. . . "

Then there is the old bugbear of initial cost which must govern any scheme, and to illustrate the kind of difficulty which arises from this we again quote Laurence, Scott who advocate the "Emcol" fan-cooled motor for dusty industries—"the user in these industries wants a motor little larger and little more expensive than a screen protected machine, and one that will not give trouble oven under the worst conditions." And cost has a bearing on the all-important question of reliability, particularly so when the cost is considered merely as part of the driven equipment. It is illogical, said Mr. Morgan (Preston & Thomas, Ltd.) to save a few shillings on a motor which is not only an integral part of a machine (refrigerator or potato peeler, for instance) costing £25, but the most likely part to put the whole equipment out of action. Similarly, Mr. West (Greenwood & Batley, Ltd.) showed how insignificant a possible saving (£5 at the most) on the motor of a battery truck would be in view of the fact that out of the total cost of probably £200 for the body, battery and motor the last costs only about £30.

Seldom do we visit a factory without hearing of the "wonderful adaptability of the electric motor," and many manu-

facturers stressed how easy it is to design a motor for any set of service conditions, providing those conditions are known in the first place. On the surface, then, it would seem that the problem is an easy one, but certain service conditions are extremely difficult to assess and perhaps the greatest of these is the kind of maintenance the motor is to have.

To illustrate this point Mr. Davey said that complaints of motors running hot often meant that the case felt hot to the hand, although actually the temperature was within the B.S.S. limit. Again, an enclosed motor is often recommended for dusty places, but as Dr. Jakeman (G.E.C.) pointed out a case can be made for the open motor where maintenance is good and the dust is not harmful to the windings, in that the sight of the dust (cement, say) is a reminder to the cleaner. Metropolitan-Vickers talked of monthly and yearly maintenance. The easy (gun-breach) fitting of the flameproof cover



The easy-fitting (gun-breach) flameproof cover and breach and slip-ring gear (Metrovick) are a contribution to "monthly maintenance"

for brush and slip-ring gear is a contribution to the former and the cartridge bearing housing is one to the latter. It is "fatal" to get dirt in a roller bearing.

Weather exercises another big influence. Cold weather (thick oil), starting difficulties and the more arduous duties of the refrigerator motor in hot weather are points raised by the B.T.H. Co., while Laurence, Scott show that such equipment as a trawl winch must be capable of operation in all weathers by almost entirely unskilled hands.

In the above we have pointed to just a few of the many general influences before considering problems associated more closely with the various types of motors because the outlook on the broader aspect so definitely governs all the more specialised questions to be raised.

Users of Industrial Power Equipment

Many times have we asked "Where do they all go to?" when viewing motors for despatch in their dozens or hundreds. In every case the answer has been more amusing that informative because the "off the shelf" motor business nowadays is so colossal. A table prepared by Metropolitan-Vickers, however, bears strongly on this point and is most illuminating. It shows eight industries which used 50 per cent. of all the industrial power equipment in Great Britain in 1930, giving, *inter alia*, the HP of motors installed and the percentage of electrification as follows: mines and quarries 1.79 million HP, 47 per cent.; iron and steel 1.44 million HP, 53 per cent.; textile 0.88 million HP, 37 per cent.; engineering and shipbuilding 1.35 million HP, 93 per cent.; local authorities (including supply undertakings) 0.41 million HP, 46 per cent.; paper, printing and stationery 0.55 million HP, 77 per cent.; food, drink and tobacco 0.50 million HP, 76 per cent.; and chemicals 0.39 million HP, 70 per cent.

Another extremely interesting point which bears also on the broader aspect is the extent to which the DC motor is used nowadays. Several manufacturers referred to the "DC motor revival." One large organisation told us that when the grid was first established they stopped their normal DC development because it seemed certain that the DC motor would gradually disappear. At first their DC motor output did actually decrease until in a few years it became only 26 per cent. Then it began to rise again and in 1937 it reached 50 per cent. The explanation given for this extraordinary state of affairs is that whereas up to recently the electrical industry had catered for the simpler drives it is now tackling the more difficult ones, not merely drives for variable speed, but those demanding variable and adjustable speed for manipulative work, and the DC motor is giving a good account of itself in such work. Crompton Parkinson, Ltd., said that the persisting DC motor demand is in the range of 1 to 60 HP.

General-purpose Motors

Exacting conditions peculiar to various applications demand "specials," but most manufacturers strive to meet the requirements common to many applications by a general-purpose motor. Ideas differ considerably as to where the line of demarcation between the special and the general-purpose motor should come.

The broadest classification we have heard of is "made-to-measure" and "ready-made." All very large motors must be made individually to specification, but among the ready-mades there must be specials. Fiery-mine motors, for instance, must satisfy the Regulations of the Mines Department. Driving requirements such as speed variation and mechanical protection dictated by factory conditions also affect design and motors are often considered in terms of the industry which they are to serve.

In choosing the headings under which we are considering motors for these articles we have been influenced largely by the relative importance attached to various aspects by manufacturers and it will probably be useful to name them at this early stage: general influences; standardisation; performance; group and individual driving; noise elimination; catering for speeds; ventilation; enclosures; heavy duty; medium duty; and fractional HP. But each of these divisions involves many subsidiary considerations and there is much overlapping.

In the course of our visits two questions became crystallised in our mind for each application: "What are the requirements, problems and difficulties?" and "How are they met?" In nearly all cases these questions brought forth satisfying answers, but not so with regard to the general-purpose motor, and we had to ask for definitions of this "universal provider."

Mr. Twizell (J. H. Holmes & Co., Ltd.), citing the "L" induction motor as typical, said that the manufacturer must assume that the motor will have no attention in service. The motor must aim at no one particular requirement, be as simple and as small as possible, mechanically robust, and capable of running continuously. "Something that will meet an average of many conditions and which is built down to a price and to comply with B.S.S.168" is Mr. Greenwood's (Harland Engineering Co., Ltd.) definition.

There is a tendency now to introduce general-purpose motors with special features such as the pure-aluminium die-cast rotor cage of the general-purpose motors of Bull Motors, and if we accept the broad definition of the g.p. motor as one which does not aim at any one particular application then the new "Indestructable" motor of Brook Motors, Ltd., is an outstanding development in this category. The principle limitation of all motors has been temperature rise because of its effect on the insulation, and the new Brook unit is one of a group of developments which have aimed at higher permissible temperatures by the use of a glass-base insulation.

The other motors to be referred to later, however, aim at particular applications. The extremely high melting point (1,900 deg. F.) of the copper covering explains the claim of 100 per cent. overload continuously, and with the growth of this idea (Brooks are convinced that all motors will be constructed in this way in the future) it is not difficult to imagine a complete change of rating outlook, for the B.S. requirement is 100 per cent. overload for 30 seconds. An interesting comparison concerning this revolutionary development is that whereas in America makers have increased the rating for the same frame size, the English manufacturer is retaining the same rating and banking on freedom from breakdown.

The pure-aluminium die-cast s.c. rotor (Bull) is a general-purpose motor special feature

In some cases g.p. motors are considered in groups covering a very wide field of applications with fairly wide divisions. Bruce Peebles point to three classes of motors to meet "an almost unlimited variation of applications in their various spheres." The "N closed" motors for up to 150 HP and the "Thru-Draft" units for larger outputs are specially ventilated machines; then there is a range of totally-enclosed fan-cooled motors of flameproof construction for fiery mines, &c.; and

A PLEA FOR THE STUDENT

By "Instructor"

THE results of the City & Guilds of London examination in electrical installation work, Course B, have now been announced, and no doubt considerable disappointment reigns among students and teachers. Certainly my own students have never shown so low a number of passes, while there is not one "first class" among them, a thing hitherto unknown. It may therefore be of interest to seek reasons for this, as I cannot believe that the standard of intelligence has fallen in the short space of one year.

A general complaint is that the time allowed for each paper —three hours—is really insufficient, and as this emanates from a large number of students in various parts of the country there may be some substance behind it. I found that I required two and a half hours to finish the paper to my own satisfaction, so that an allowance of three hours for the average student would not seem too long. May we have another half-hour next year, please?

Choice of Questions

With one exception, the actual questions in the papers cannot be objected to; they are really excellent this year. They range from the practical to the theoretical with complete equality, and as each question carries the same number of marks—excepting the drawing—all would appear to have an equal chance. Out of eight questions in each paper six have to be answered. This does not provide much choice, and I would suggest that the questions should be increased to nine.

The one exception referred to is Question 8 in the second paper. This states: "Make a sketch showing a heating element suitable for a domestic electric kettle. Calculate the time taken by a 1,500-W electric kettle in raising the temperature of 3 pints of water from 15 deg. C. to boiling point. Assume the efficiency of the kettle to be 90 per cent. (To raise the temperature of 1 lb. of water 1 deg. C. requires 1,900 joules.)"

Now we have in this country a perfectly good British Thermal Unit, and all my own students are trained on this. This unit is used by most manufacturers of water heaters, &c., and is shown in most formulæ and data relating to water heating. It necessitates the use of Fahrenheit degrees, however, and in the short time available for instruction, time must not be taken for any consideration of c.g.s. units, or Centigrade degrees; even learning conversion factors takes up time that could be more advantageously used in other directions, with the result that a general concentration has been made on degrees Fahrenheit.

This is supported by the fact that the I.E.E. Wiring Regulations—upon which the whole Course B is based—make the use of degrees F. universal in connection with cables, &c., as will be found from reference to the tables of current-carrying capacity, ambient temperature, &c. As the revised tables in the eleventh edition were in turn based upon experimental work carried out by the E.R.A., it is reasonable to assume that the use of Fahrenheit degrees has the blessing of this important body also.

The B.S.I., on the other hand, cannot apparently make up its mind which to use—a regrettable lapse on the part of a standardising body—as reference to recent Specifications shows. For instance, No. 842, "Leakage Circuit Breakers," employs Centigrade, as does No. 831, "Transformers"; on the other hand, No. 816, "Minimum Requirements," uses Fahrenheit degrees, and, be it noted, especially in connection with electrode water heaters, page 13, while for heating and cooking appliances, page 11, both are used side by side, as follows: 170 deg. F. (76.6 deg. C.).

It must be remembered that the City & Guilds Course B is designed for the training of wiremen, and the lads that we get attending evening classes in electrical installation work have not all had the advantage of a secondary school education; in fact, the proportion is two-thirds elementary school against the remaining third who enjoy a better education. I am sure that the sympathy of the industry will rest with instructors like myself who watch over the attempts of some of these lads to cope with AC calculations—reactance, capacity, power factor, phase angle, angle of lag, &c., and I feel that we could, with advantage, be relieved of dealing with dual temperature calculations in addition.

I will readily agree that any lad who can carry out a reasonably simple calculation could cope with the question that has been quoted above, but I find that the reference to Centigrade degrees has had the result of frightening several off the question, or perhaps I should say that, given the choice, they have avoided Question 8 by reason of its reference to degrees C, selecting instead a question that they are not so fitted to answer.

Unnecessary Calculations

Surely, if a wireman can make a satisfactory calculation from common data like BThU and deg. F. there is no need to ask him to perform a few mental gymnastics in addition by wrapping the question up in Centigrade degrees. I would most earnestly ask the City & Guilds of London to concentrate upon Fahrenheit degrees in their syllabuses and examination papers, with a view to assisting both instructors and students who are solely concerned with Course B.

For the student taking a higher course, or for those lads who are fortunate enough to take a day course in electrical installation work, the present arrangement can only be commended; I have in mind, however, the thousands of provincial lads who merely get three evenings a week for three winters to complete their studies, and who must, in general, be taught arithmetic, &c., from its early stages. They will, however, make perfectly good wiremen, and secure the necessary certificates, if we do not handicap them too much.

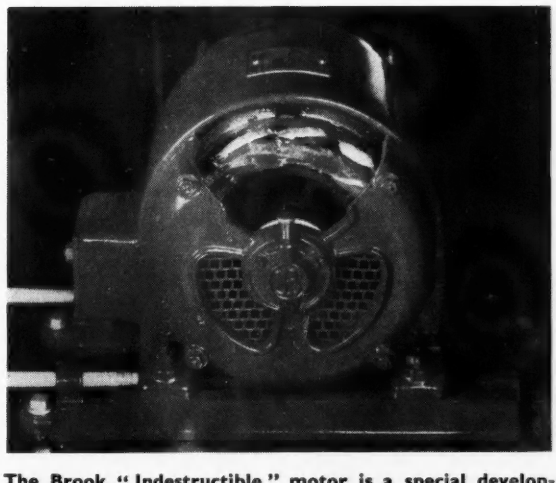
Motor Survey (*Continued*)

finally "Steel Clad" motors for severe conditions in heavy industries.

The Laurence, Scott policy aims at eliminating specials, but the field of the g.p. motor is enlarged so as to cater for what would otherwise be specials by modifications to the g.p. motor. Such modifications are readily brought about by the fabricated construction adopted together with suitable workshop organisation. The general requirements for standard industrial applications are given as: a wide range of ratings and speeds, a reasonable choice of mountings and enclosures, sufficient choice of electrical characteristics to suit the drive, and prompt delivery. The listed "Emcol," steel-frame induction and DC motors were referred to as g.p. machines, while the crane and lift, loom, fan-cooled DC, and "Low current" motors were described as modified g.p. equipments.

Mr. Richards of Higgs Motors, Ltd., who referred to the main limitations of the standard motor as starting torque and supply restrictions, said that the tendency was to use fan-cooled motors for all purposes, and whereas a few years ago the fan-cooled equipment meant double the price, to-day it cost only about 25 per cent. more. Although his factory was laid out for mass production, 15 per cent. of the output was specials which, however, were such modifications as extended shafts and feetless bodies which could be catered for at only a few shillings extra cost. The standard Crompton Parkinson motor (AC & DC) embraces such modifications as vertical driving, flange mounting, screen protection, pipe ventilation, deluge-proof and special shafts.

Standardisation is necessarily closely linked with mass production and Mr. Cass (Crompton Parkinson) said that the advantage of the latter to the customer is quick delivery and service. The aim is to reduce components to a minimum and to keep as many as possible common to the largest number of motors so that the customer can drastically reduce his spares.



The Brook "Indestructible" motor is a special development, but it is "general purpose" in application

ELECTRONIC WATTMETER

Its Use in Delineation of Power Wave-forms

By I. E. Rosenzweig (Poland)

THE oscillographic investigation of power wave-forms is becoming necessary for electrical research and testing work. For this purpose I suggest delineation apparatus consisting of a normal cathode-ray oscillograph connected with a special electronic wattmeter, essential parts of which are grid-controlled vacuum tubes. The wattmeter transforms inertia-lessly the instantaneous power value into proportional voltage which appears on its output terminals. When the latter are connected with the deflection plates of the cathode-ray tube, beam deflections are caused which are at any time proportional to the instantaneous power.

When compared with all hitherto existing arrangements for the delineation of power wave-forms the electronic wattmeter has the advantages of extremely small inertia, so permitting one to test circuits of low frequency as well as those of the highest frequency and, moreover, it can be used for recording power transients by travelling waves.

The electronic wattmeter renders it possible to investigate circuits with very small power values (of a few milliwatts), is designed as an independent apparatus and can be used in connection with any normal type of cathode-ray oscillograph, while the apparatus can be easily adapted for every required value of the current intensity and of circuit voltage appropriate to such work.

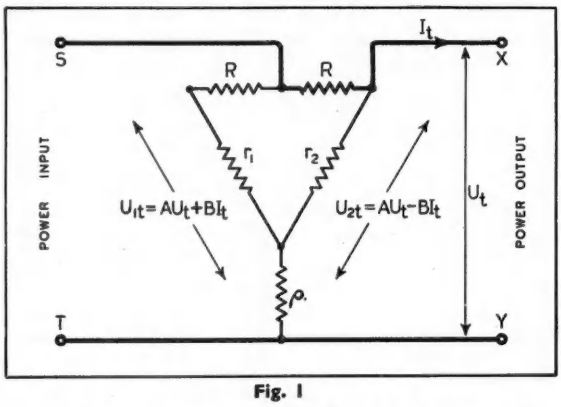


Fig. 1

The outfit has been developed on the basis of the well-known resistance circuit used in thermo-electric wattmeters (fig. 1) and measurement of the instantaneous power $P_t=U_tI_t$ consists in making use of the following formula:

$$(A\,U_t+B\,I_t)^2-(A\,U_t-B\,I_t)^2=4AB\,U_t\,I_t=4AB\,P_t \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Assuming suitable values of the resistances R_1, R, r_1, r_2 and *ρ we obtain the quantities $(A\,U_t+B\,I_t)$ and $(A\,U_t-B\,I_t)$ directly equal to the instant values of voltages U_{1t} and U_{2t}, indicated on fig. 1. Thus the value P_t is expressed by the equation

$$P_t=C\,(U_{1t}^2-U_{2t}^2) \quad \ldots\ldots\ldots\ldots\ldots (2)$$

where the factor C has the value

$$\frac{1}{4AB}$$

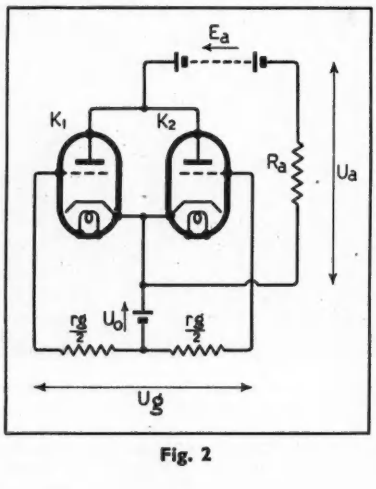


Fig. 2

Formula (2) indicates that for oscillographic purposes special means must be used to determine almost inertia-lessly the square-values of the voltages U_{1t} and U_{2t}. The essential part of this squaring-arrangement (fig. 2) forms two identical grid-controlled valves K_1 and K_2. Using a suitable value of the grid-potential u_o one can obtain a characteristic curve that

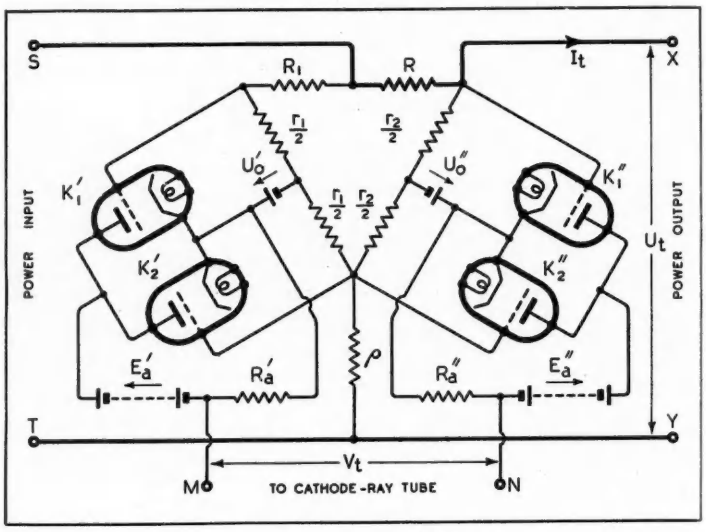


Fig. 3

can be expressed as

$$\Delta U_a=U_a-U_{ao}=a\,U_g^2 \quad \ldots\ldots\ldots\ldots\ldots (3)$$

where U_{ao} denotes in this formula the value of U_a which appears in the case of $U_g=O$.

The electronic wattmeter, the general wiring diagram of which is shown in fig. 3, consists of two squaring-arrangements as described above joined into the resistance circuit indicated in fig. 1. The resistances r_1 and r_2 of the wattmeter circuit are thereby used direct as grid resistances (r_g) of the squaring-arrangements.

Taking into consideration the formulæ (1), (2) and (3) the voltage that appears on the terminals MN can be expressed as

$$V_t=a\,U_{1t}^2-U_{1t}+U_{2t}-a\,U_{2t}^2=4AB\,a\,P_t-2B\,I_t \quad \ldots (4)$$

The quantity $2B\,I_t$ which, in itself, is of very small value, can be entirely eliminated by means of adjustment of the squaring-circuits. This consists in aligning the squaring-arrangements in such a way that in the expression of the relationship between U_a and U_g appears a linear component ($b\,U_g$). We obtain in this case instead of formula (4) the equation

$$V_t=(a\,U_{1t}^2+b\,U_{1t})-U_{1t}+U_{2t}-(a\,U_{2t}^2+b\,U_{2t})=4AB\,a\,P_t-2B\,(1-b)\,I_t$$

and assuming $b=1$, this gives

$$V_t=4AB\,a\,P_t=K\,P_t \quad \ldots\ldots\ldots\ldots\ldots (5)$$

Thus, the voltage V_t on the terminals MN of the electronic wattmeter is at any time proportional to the corresponding instantaneous value of the power $P_t=U_t\,I_t$. The terminals MN can be connected with the deflection plates of a cathode-ray tube either direct or by means of an amplifier.

Assuming an accuracy equal to about 5 per cent. one particular electronic wattmeter was used for the investigation of peak-values of about 10 mA and 30 V; thus the highest measurable instantaneous power amounted to 300 mW, which corresponded to a terminal deflection voltage of 80. Hence, the power sensitivity of the apparatus was 270 volts/watt. The obtained values of V_t were quite sufficient to be used direct, without any amplifier, for the deflection of the electron-beam in normal types of cathode-ray oscillographs.

* For this purpose such values of R_1, R, r_1, r_2 and ρ must be taken that

$$R_1r_2=(R\,r_2=(R-R_1)\rho$$

Iron and Steel Conference

AMONG the papers to be submitted at the annual meeting of the Iron and Steel Institute which is to be held at Cardiff from September 12th to 15th, is one on "An X-ray Investigation of the Iron-rich Nickel-iron Alloys," by Messrs. A. J. Bradley and H. J. Goldschmidt.

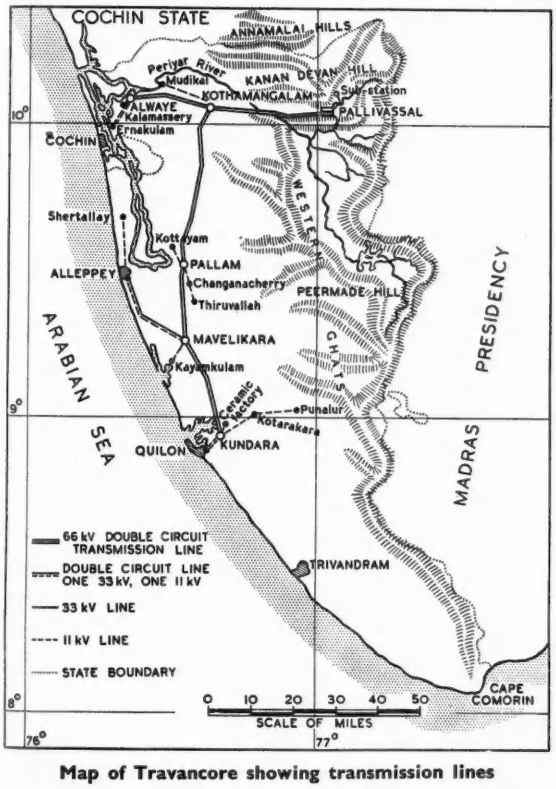
ELECTRICITY IN TRAVANCORE

Water Power Development

By R. L. Chantrill, B.Sc., M.I.E.E., and W. H. Thompson

ALONGSIDE the Western seaboard of the Indian Peninsula runs the range of hills known as the Western Ghats. Between them and the Arabian Sea is the State of Travancore, a triangular area of 7,800 sq. miles having Cape Comorin, the southernmost point of India, as its apex. The country is served by ports at Cochin, Alleppey, Quilon and Trivandrum (the State capital). The last three are frequently closed during the south-west monsoon but the port of Cochin, the most northerly, is open the whole year round. Full use has been made of an extensive system of inland waterways and roads in delivering to site the material required for the Pallivassal hydro-electric project.

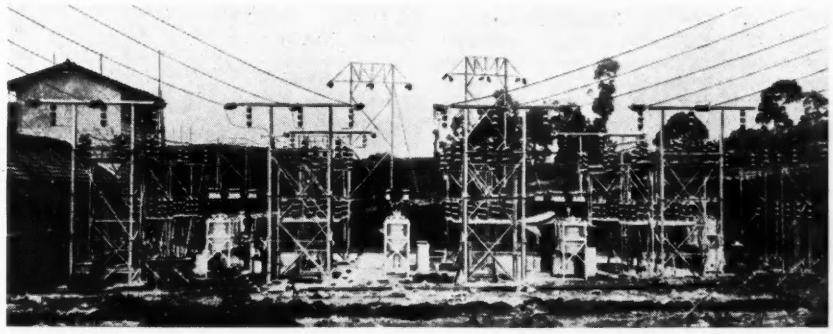
Mr. K. P. P. Menon, chief electrical engineer to the Government of the Maharaja of Travancore, after investigating the possibilities of hydro-electric development drew up a scheme for utilising the water resources of the High Range, which promised to become quickly self-supporting, although not necessarily having the largest potentialities. The present scheme utilises the head available in the Munnar River, which draws its water from the catchment area of the Kanan Devan Hills of the High Range.



Map of Travancore showing transmission lines

The first stage comprises the installation of the machinery and civil works, with transmission lines extending as far as Alwaye, Alleppey and Quilon and generating plant capacity suitable for the initial load. Thus, this stage of the scheme covers a fairly considerable portion of the State's total area and it has been designed so that the transmission system can be extended easily to further areas when necessary.

In addition to the potentialities in the ultimate development of the existing site there are other sites within the State which can be taken up and connected in to the present system. The maximum capacity, about 25,000 kW, to which the present power station can be extended is limited by the amount of water which can be stored economically in the hills to supplement the minimum flow of the river. Ultimately the waters discharged into the tailrace will be utilised in a further fall.



General view of Kothamangalam sub-station

The off-take of the Munnar River has been located to make use of the largest possible catchment area consistent with the economic utilisation in the first stage of the maximum head available. Some of its tributaries have suitable sites for dams to impound and conserve the high monsoon run-off in the catchment area. Such storage reservoirs will be built as required by load conditions to supplement the minimum flow of the river during the dry months.

The water of the river is decanted by a weir and then passes through a channel on its way to the tunnel and forebay. It was found impracticable to run an open or protected channel along the mountain-side to the forebay because of the crumbling nature of the surface rock, so a tunnel, approximately 10,000 ft. long, has been built to connect the offtake with pipe line forebay and surge shaft. A pipe line, consisting of two pipes each 7,700 ft. long in parallel for the first installation, connects the tunnel exit with the power house. The weir crest in the Munnar River at the off-take is about 4,760 ft. and the tailrace 2,750 ft. above sea level. This produces a net effective head of 1,877 ft. at each turbine nozzle.

Power Plant

The power house is located on rock on the banks of the river, into which the tailrace discharges. The first stage of the generating station comprises three 6,000-BHP Pelton waterwheels running at 750 RPM coupled directly to 4,500-kVA 11-kV alternators, the bucket wheel being bolted to the overhung alternator shaft. As each pipe of the twin-pipe line supplies enough water for one generating unit only, the Pelton wheels are connected through valves so arranged that any two machines can be operated together. Rise of pressure in the pipe line and variations of speed of the generating units are limited by a special governor and jet deflectors.

Both alternators are designed to be capable of supplying line charging current for the transmission system at leading power factor under no-load conditions. Mechanically operated interlocked triple-pole air-break isolators in conjunction with a transfer busbar enable each alternator to be connected direct to any one of three 5,000-kVA, 11/11/66-kV outdoor transformers. The transformers have three windings; the function of the third being to transmit power at 11 kV to the tea estates in the Kanan Devan Hills without direct connection of overhead transmission lines to the alternator windings.

The 66-kV switchgear associated with the 5,000-kVA transformers has been placed out-of-doors alongside the power house with the outgoing double-circuit 66-kV line connected direct.

The layout of the transmission system is indicated on the accompanying map, and comprises a double-circuit 66-kV line from Pallivassal to Kothamangalam (32 miles), whence it continues to Pallam (37.5 miles), Mavelikara (24 miles) and Kundara (22 miles). From Kothamangalam a similar line is taken to Alwaye (19.5 miles). From Mavelikara a double-circuit 33-kV line runs to Alleppey (26.5 miles); one circuit is operated at 33 kV and the other at 11 kV (initially) for local

distribution. There is a double-circuit 11-kV line from the power house to High Range two miles away and 105 miles or so of single circuit 11-kV line for local transmission.

The 66-kV lines consist of stranded-copper and cadmium-copper conductors carried in vertical formation, one circuit on each side of a tower, except for about one mile from each sub-station within which horizontal spacing with single-circuit towers and two ground wires per circuit is adopted.

The 33-kV line has been built on 66-kV towers to permit the line voltage being raised at a later date. All the 11-kV lines are carried on teakwood poles from the forest of Travancore. A plant has been installed for treating the poles by the Ascu process for resisting attack by termites.

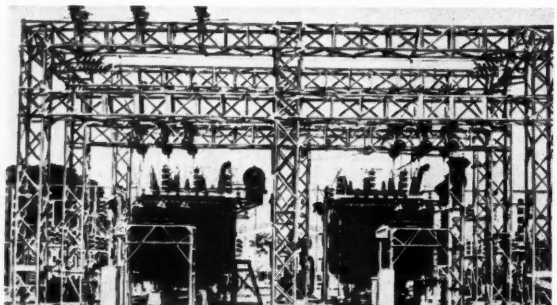
In the Hills Section from Pallivassal to Kothamangalam, the lines pass through very dense jungles and precautions have been taken to protect them from damage by elephants.

Sub-Stations

Switching stations have been provided at Kothamangalam to control the 66-kV branch line to Alwaye and the main 66-kV trunk line to Pallam; at Mavelikara to control the 66-kV trunk line and the branch lines at the lower voltages to Alleppey; and at Kundara to control the present terminus of the 66-kV trunk transmission line. At these points transformers have also been installed for supplying the local load through the lower-voltage branch lines radiating from them. In the first case there are two 500-kVA 66/11-kV units, in the second two 3,500-kVA, 66/11/33 units and at Kundara two 2,000-kVA, 66/11/11-kV units.

In addition, 66-kV sub-stations have been provided at Pallam and Alwaye, each with two 2,000-kVA 66/11/11-kV transformers, and a 33-kV sub-station at Alleppey with one 1,250-kVA, 33/11-kV transformer. In addition, there are 11-kV sub-stations at Quilon (two 250-kVA, 11/3.3-kV units) and at Kothayam Tiruvalla, Changunachery and Sherthallay forming the Alleppey distribution group (each having either a 125-kVA or 250-kVA, 11-kV/415-V transformer). Three-phase transformers have been installed throughout.

The three-winding transformers are star connected on the 66-kV side with neutral point solidly earthed. Each 3,500-kVA transformer has its 33-kV winding star connected with the neutral point earthed through an arc-suppression coil and its 11-kV winding connected in delta to suppress harmonics. This



Mavelikara sub-station

11-kV tertiary winding is connected through the sub-station switchgear to an earthing transformer so as to provide the 11-kV system with an earthed neutral point. The 2,000-kVA transformers have their main 11-kV secondary windings star connected and earthed solid; their tertiary 11-kV windings (rated at 500 kVA) in delta carry no load.

With the exception of Kothamangalam, the 66-kV neutral points are solidly earthed at each 66-kV station. The 66-kV outdoor switching and transforming stations have all been laid out on the mesh principle, which incorporates a ring busbar with oil circuit-breakers in the ring. In many cases only the minimum amount of equipment has been installed and the mesh will be completed at some later date when the stations are extended. A complete mesh has been installed at Kothamangalam and Mavelikara.

To protect the apparatus from severe climatic vagaries a heater element is included inside each oil circuit-breaker mechanism box and in each outdoor terminal box to maintain the air temperature well above dew point. A heater is also inserted in each outdoor oil circuit-breaker tank and in each outdoor power-transformer conservator oil tank to maintain the top 2 in. of oil level approximately 10 deg. C. above that of the surrounding air.

The transmission line varies considerably in its height above ground. This has necessitated insulating the line so as to prevent as far as possible flash-over during thunderstorms. At the same time the insulation level of the approach lines had to be co-related so as to avoid surges of exceptional magnitude which originate in the lines reaching sub-station apparatus.

Both in the hills and plains, the insulation values of outdoor switchgear and transformers are carefully co-related in accordance with the impulse strengths of the various components. The various typical posts, insulator strings and bushing insulators were tested at the impulse generating station of the Metropolitan-Vickers high-voltage research laboratory. The tests were carried out under the direction of Messrs. Kennedy & Donkin, inspecting engineers for the Government.

Arrangement of Lines

In order to ensure the attenuation of impulse waves which may originate in the highly insulated overhead lines, the conductors of the double-circuit lines are changed in their configuration from vertical spacing and are brought down to horizontal spacing as near the ground as is reasonably possible; these horizontally spaced lines are provided with two ground wires per circuit as against a single ground wire carried on the top of the double-circuit towers.

The mesh layout of the 66-kV switchgear entails the operation of two circuit-breakers in order to connect or disconnect a transmission line or transformer. This arrangement makes every piece of apparatus accessible without shutting the station down completely. It also permits a layout in which the average height of the connections is at a comparatively low level above ground.

Each breaker is fitted with cross-jet arc-control and when tested by the Switchgear Testing Co., Ltd., successfully broke short-circuits in excess of 500,000 kVA at 66 kV. They are operated by centrifugal operating mechanisms from a 110-V battery. The current transformers incorporated have cores containing a proportion of mu-metal which gives sensitivity and stability to the protective gear on heavy through-fault currents.

The high-voltage isolating switches are of the high-pressure contact type and are hand-operated by mechanism which is provided with auxiliary switches to provide indication on the control board. The mechanically operated mechanism of the earthing switches is interlocked with that of the line isolators so the line can be earthed only when the isolator is open.

The 11-kV switchgear at the sub-stations comprises small metal-clad draw-out indoor equipments, so that the control of each station is under the direct supervision of operators protected from the weather. Outdoor circuits are connected by means of paper-insulated cables.

The double-circuit 66-kV transmission lines have been provided with parallel feeder protective gear, and back-up over-current protection. The 33-kV line from Mavelikara to Alleppey will be protected by an arc-suppression coil tuned to the particular length of line in service.

The parallel feeder protective relays are Metropolitan-Vickers "NFD" attracted armature pattern of the differential directional type; these relays are used in conjunction with a type "AK" escapement pattern relay for time discrimination. For over-current protection and for stand-by protection "PB" and "NP" relays are used.

Control Boards

The control boards have been located in small control houses adjacent to the outdoor switchgear. All instruments and meters are sealed in such a way that insects cannot penetrate the cases. All panel wiring has been carried out with cambric-insulated, fireproof treated, single-core cable.

Between each control panel and the corresponding high-voltage oil circuit-breaker one multi-core paper-insulated, lead-covered cable has been run. This cable is terminated in a multi-core sealing box mounted at the bottom of the panel, tails being brought out to a terminal board. The outdoor end of each cable is terminated by another sealing box in a weatherproof housing adjacent to each oil circuit-breaker.

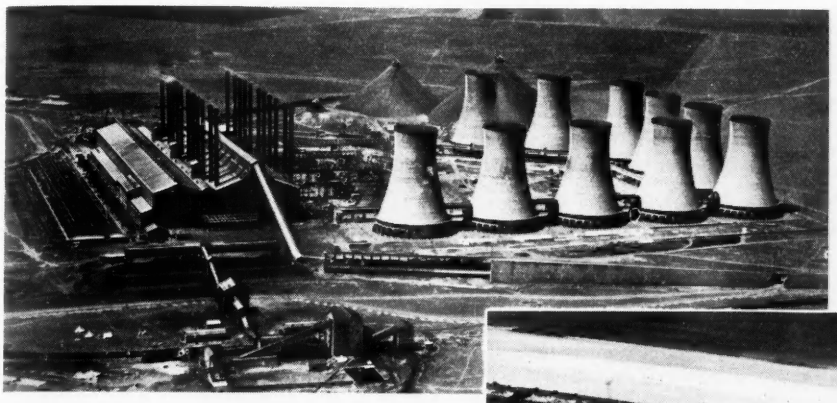
From the outdoor terminal housing, multi-core branch control cables have been run to the auxiliary switches of the isolator and circuit-breaker operating mechanisms and to the circuit-breaker bushing current transformers. The ends of these cables, which are varnished cambric insulated, lead-covered and served overall, are sealed by a terminal device.

The main contractors were Associated Electrical Industries (India), Ltd., which supplied Metropolitan-Vickers 6.6-kV, 33-kV and low-voltage AC and DC switchgear, B.T.H. 11-kV switchgear for the 66-kV sub-stations, Ferguson, Pailin 11-kV switchgear for Quilon sub-station and B.T.H. power transformers; Callender's Cable & Construction Co., Ltd., who provided and erected the 66- and 33-kV transmission lines; General Electric Co. (India), Ltd., who supplied the material for the 33-kV sub-station at Alleppey and the 11-kV rural sub-stations. Harrison & Crossfield, acting for Boving & Co., supplied the pipeline made by Ferrum, Ltd.; Volkart Bros. supplied Escher Wyss water wheels and Brown Boveri power-house plant.

SOUTH AFRICAN COMMISSION

Plan to Connect 1,000 Scattered Farms

ALONGSIDE its necessary programme of plant extensions to meet the demands of the mining industry, which takes more than three-quarters of the total quantity of electricity sold, the South African Electricity Supply Commission is pursuing an enterprising policy of finding new outlets for its supplies. Thus, having connected up practically all the towns, villages and groups of farms within economic reach of sub-stations along the routes of the electrified railways in Natal and the Orange Free State, the Commission decided last year to investigate the potentialities of the more remote areas, and as a result has embarked upon a scheme contemplating the supply of electricity to more than 1,000 scattered farms within an area of 15 miles on each side of the railways by means of an 11-kV line erected on the track structures and tapped at suitable points. In order to make such supplies economically possible, consumers are invited to co-operate by providing transport and native labour for pole erection, &c.



The Klip power station, owned by the South African Electricity Supply Commission, shown above, is situated near Vereeniging, Transvaal, and is the largest generating station in the southern hemisphere. The Salt River power station (right) supplies power under a pooling arrangement with the Capetown Corporation to the city and the Cape rural areas, as well as for the electric railways

Since the completion of the railway electrification to the border town of Volksrust, development of rural supplies from the Natal Central undertaking has been extended to the township of Wakkerstroom, in the Transvaal, and extensions of the supply to other communities are proceeding. On the Natal coast, the Commission has extended its activities as far south as Margate, approximately 100 miles from Durban, and most of the seaside towns have been or will be connected to the system. In the western Cape Province numerous extensions to farm supply schemes, especially in the fruit growing areas, were carried out during the year. Negotiations were completed for supplying electricity to 600 houses at Epping Garden Village, Goodwood, every one of which will be wired for an electric cooker.

Promotional work carried out by the Commission has included the production of a film descriptive of its activities for exhibition to selected audiences locally and overseas, and sub-standard size copies of the film are being made for exhibition in schools. An innovation during the year was the attendance of domestic science pupils from Johannesburg schools at the cooking demonstrations at Escom House, and this scheme is being extended. Articles to educate consumers in the better use of electrical appliances are published in both national and country newspapers.

At the end of 1938 the Commission owned five steam stations (Klip, Witbank, Congella, Salt River and Colenso), one hydro-electric station (Sabie) and four small oil-engine stations (Volksrust, Margate, Umkomaas and Scottburgh). The generating plant capacity was increased by 103,387 kW during the year and the total capacity of plant installed or on order was 782,230 kW. Since the close of the year a ninth 33,000-kW set has been started up at the Klip station, two more are being placed in service this year, and the twelfth in February next year. With four 7,000-kW house sets (three of which were in operation at the end of last year) this will bring the station up to its ultimate plant capacity of 24,000 kW. The full complement of ten hyperbolic type cooling towers, 220 ft. high, designed to deal with two million gallons of water an hour each, has been completed.

An important scheme initiated during last year was the construction of the new Vaal generating station, which will form yet another link in the chain of stations supplying the Witwatersrand gold mines, towns and industries. As in the case of the Klip and Witbank stations, the new power house will be financed and owned by the Commission, while the Victoria Falls and Transvaal Power Co., Ltd., will operate the station as part of the joint power supply system on the Witwatersrand.

The Vaal station will have an initial installation of 108,000 kW, but it will be capable of extension to 400,000 kW. A feature of the station will be two hyperbolic cooling towers 320 ft. high each designed to deal with four million gallons of water an hour —twice as much as the Klip towers. The initial expenditure on the station is estimated at £2,039,000.

At the Congella power station of the Durban undertaking a further 40,000-kW set and three boilers are to be installed. In addition, the Commission is interested in the Cape Town Corporation's new Table Bay power station under a pooling arrangement. Favourable weather conditions and the absence of major plant troubles such as were experienced in the previous year, enabled the pooled power stations of the Commission (Salt River) and the Corporation (Dock Road) to meet the increased demand without the anticipated assistance of this station, which was expected to be ready before the winter peak load in 1938, but late deliveries of plant caused delay.

Altogether 3,375.4 million kWh was generated at the Commission's power stations, more than half of this amount (1,775.1 million kWh) being produced at the Klip station, where the load factor was 87.0 per cent. and the thermal efficiency on kWh sent out was 21.4 per cent. At this station the average price per kWh sold was 0.086d., the average cost per ton of 2,000 lb. being only 3s. 3d. At Witbank the cost of coal was still less—2s. 1d. per ton—but the thermal efficiency of the station was only 16.2 per cent.

Sales of electricity, excluding energy supplied to Cape Town Corporation under the pooling arrangement, amounted to 2,985.4 million kWh, an increase of nearly 18 per cent. The following is an analysis of the supplies to various classes of consumers by the Commission's undertakings :—

Undertaking	Traction (million kWh)	Bulk (million kWh)	Industrial and mining (million kWh)	Domestic and lighting (million kWh)	Total (million kWh)
Cape Town ...	51.9	12.3	28.1	6.5	98.8
Durban ...	—	206.6	2.1	0.8	209.5
Klip	—	1,666.9	—	—	1,666.9
Natal Central...	193.5	31.3	8.1	2.0	234.9
Sabie	—	—	7.2	—	7.2
Witbank ...	63.5	624.5	78.9	1.2	768.1
Totals	308.9	2,541.6	124.4	10.5	2,985.4

(*Continued at foot of next page.*)

CORROSION RESISTANCE

Lead-plating as a Cheap and Efficient Method

By C. C. Downie

USUALLY plant which is expected to resist strong acids is lined with lead, but the common desire to economise has assisted the introduction of lead-plating as a cheap and efficient substitute. The original use of lead in this form was largely for lining gas shells, while fire-fighting equipment involving the use of sulphuric acid was dealt with similarly. In the intervening years, the electrolytic means of deposition has been materially improved and it is now possible to hasten the process by the application of superposed AC.

This is an expensive method of carrying out electrolysis, particularly for a cheap metal such as lead, but the system has been most economically successful for the more expensive metals, and for certain chemical products. If cheaper electricity were available the probability is that most electro-deposition processes would be assisted by superposed AC.

The amount of metal deposited per ampère-hour, or the amperage required to plate a square foot of surface, etc., are entirely dependent upon the resistance which is set up to the passage of the current. This can be largely eliminated by the presence of AC, which should be of low frequency to secure the best results. Hence variable frequency alternators are in commercial operation in some of the larger gold refineries, and also in the preparation of certain chemical compounds. Ordinary electro-deposition is invariably a slow process, but if gas shells should again be required, there is little doubt that the rapid AC process would be introduced.

Lining Tanks and Vats

Most research has been carried out in the U.S.A. and Germany, but so far as the construction of the electrolysis bath and composition of the electrolyte are concerned, little change has taken place. Apart from the foregoing use, great efforts have been made to line tanks and vats used for corrosive chemicals directly by means of a portable type of electrolytic deposition plant, the latest models of which consists of a small generator set, linked to the ordinary lighting mains and providing the desired DC. This is connected to an instrument resembling a trowel, the surfaces of which are soaked by a flow of the electrolyte. The tank or vat to be plated is cleaned out, and the trowel rubbed over the exposed metal so that lead is deposited in much the same manner as in a plating bath. The leads can be made lengthy so that the operator can work from one end of the tank to the other without stopping.

It was soon realised, in actual practice, that the total depth of lead which could be so plated was too slight to resist corrosion of a serious nature, and frequent repetition of the treatment became necessary. On the other hand, many lead-lined tanks are far too thick, so being unnecessarily expensive. A happy medium can be obtained by setting up a temporary, but otherwise complete, small electrolytic bath on the side of the tank. Instead of being limited to the use of a weak electrolyte with the trowel, it is possible to use solid lead anodes, or the bath itself can be made of thick sheet lead, and thus serve as the source of lead.

A thick layer of plaster is laid on the surface of the tank where the bath has to be placed, and allowed partly to solidify. The box-shaped bath is then thrust into the soft mass, which sets rapidly, with the advantage that the faces of bath and tank are about 3 in. apart, which is ideal for deposition work. Different types of screws can be used to hold the bath in position until the plaster is set, and then removed. The electrolyte is charged in from the top of the bath, and contacts made with the current connections from temporary bus-bars above. In this manner thick sound deposits of lead are obtained, unknown to methods other than the usual independent plating bath.

Use of Fluoborate Solutions

Although fluosilicate electrolytes were originally adopted, a much better, and more impervious deposit is secured by using fluoborate solutions. The electrolyte should contain about 16 per cent. lead as lead fluoborate, together with about 1 to 1.5 per cent. free boric acid, and 0.5 per cent. gelatine. The deposit of lead comes down slowly at first, until heat caused by resistance to the passage of the current raises the temperature to about 35 deg. C. Much current is lost, but is more than compensated for by the fact that the side of the tank is lined with lead with the utmost rapidity, and to any desired thickness of deposit. With a square-sectioned tank, the four sides and bottom are plated simultaneously, if a sufficiency of current is available.

The four temporarily fitted baths are purposely raised from the bottom and set in plaster, so as to leave sufficient space for the latter also to receive its deposit. The solution of fluoborate is run into the bottom of the tank, and a plate of lead (or more than one sheet, when required) laid in position, on top of plaster pegs. When the surface plating has been finished off in the usual manner, the corners of the tank, and small spaces where the pegs lie, have to be dealt with. The pegs can be fitted to lead stools, which are burned to the bottom before commencing the electrolysis, but the corners require separate vertical lead baths, which are plated at a second operation. By manipulating the positions of the different baths it is possible to leave no section uncovered by the lead deposit. The expenditure necessary in actual practice amounts to a mere fraction of the cost of lining vats and tanks with sheet lead, because the latter system invariably provides too much lead.

All kinds of baths are used in dyeing, bleaching, and similar pursuits, apart from general chemical practice, which require to be protected by lead, and when they are at all similar in dimensions the same outfit can be used repeatedly. It can be argued that much current is expended unnecessarily on metal which has not to be plated, but the total cost is less than that of direct lead-lining, while many sheet-metal tanks are not suited for the latter process.

Since the process was introduced, some scrap firms have had it applied to disused tanks, some of which had reached the rusted stage, and have been able to reclaim them, and return them for service.

South African Commission (*Concluded from previous page*)

Under " bulk " is included 2,290.5 million kWh for mining and 251.2 million kWh taken by sixteen local authorities mainly for domestic consumers whose average consumption ranged from 490 kWh at Malmesbury to 2,874 kWh at Maritzburg. The average consumption of the Commission's domestic customers rose from 1,385 kWh in 1937 to 1,484 kWh during last year.

There are now 590 route miles of electrified railways in the Union, and more than 25 per cent. of the traffic handled by the South African Railways is being hauled by electric power. Work on the electrification of the Rossburgh-Hillcrest section of the Natal old main line (23 route miles) has been started, and two double-unit mercury-arc rectifier sub-stations at Escombe and Kloof are being provided by the Commission. It is anticipated that this work will be completed during 1940.

The Commission's loan capital which, at the date of the balance sheet, totalled £16,250,000, was increased in April, 1939, to £18,250,000 by the issue of £2,000,000 local registered stock to finance capital commitments in respect of the Klip generating station, further plant extensions at the Congella power station, and immediate requirements in connection with the new Vaal station. The amount was fully subscribed within a few hours of the opening of the lists. The amount in the redemption fund at December 31st, 1938, stood at £1,910,214, and the reserve fund at that date amounted to £1,255,224. Expenditure on capital account during the year amounted to £2,123,531, which brought the total capital expenditure at December 31st, 1938, up to £17,148,484.

The 1938 revenue was £2,232,022 (against £1,930,719) and costs were £2,218,696 (£1,909,918), leaving £13,326 (£20,801).

The average price per kWh sold was 0.176d. (0.180d.) and revenue including sundry income 0.179d. (0.183d.), the average cost per kWh sold being 0.178d. (0.181d.). The average cost of fuel per kWh sold was 0.059d. (0.065d.), the total coal consumption in tons of 2,000lb. being 2,630,740 (2,263,064).

The Commission is constituted of Dr. H. J. Van der Bijl (chairman) and Messrs. A. M. Jacobs, R. B. Waterston and W. P. M. Henderson.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electrically-driven Gas Washers

WHEN I was serving my time as an apprentice electrician some twenty-eight years ago one of the first things that I was told was always to keep an installation 3 or 4 in. away from a gas pipe, and since becoming a journeyman and a charge hand I have had full proof of this necessity.

Now the public is asked to buy, and the tradesman is required to fix, gas washing machines driven by electric motors. Surely there is something wrong here?

The salesmen tell us that there is no danger if the machines are properly installed, but how do they know? Are these washers properly installed? The gasfitter fixes the pipe to the boiler and the flexible lead to the motor is either plugged into a two-pin socket or into a lampholder and the supply authority knows nothing about it until an explosion takes place or someone receives a shock that may prove fatal.

If we electricians put in an installation and inadvertently place our conduit nearer than we should to a gas pipe, we are politely asked by the inspector of installations to attend to it before the installation can be connected to the mains.

Have the Electricity Commissioners or the Institution of Electrical Engineers looked into this matter? J. ROSE.

Bacup, *August 1st.*

I.E.E. Regulations

May I suggest to Mr. Taunton that his "re-statement" of Rule 106 is not the only possible rendering: as to its fairness I make no comment, except to point out that there is no suggestion in the Rule itself, as I see it, of anything being done in breach of Rule 105.

As I read Rule 106 it means that, where a splitter is used, and the restrictions laid down in Clauses A and B are not exceeded, the consumer's main fuses may be omitted without the necessity for obtaining the consent of the supply authority. So much for Clauses A and B.

As for Clause C, it is possible that this puts the cart before the horse. It is not likely that anybody is going to ask the consent of the supply authority to the omission of his main fuses when he is at liberty to do this without such consent, if his load allows of the provisions of Clauses A and B being fulfilled. (Observe that a footnote to Table 2 says that he is "permitted" to omit these fuses under Regulation 106.)

If, however, the exigencies of his load do not allow of the restrictions laid down in Clauses A and B being observed, he is not without remedy (although he was under the tenth edition of the Regulations). If he can obtain the consent of the supply authority to the omission of his main fuses, and his service fuses are for his own use alone, then he is at liberty to use splitters without restriction as to the number of ways, or as to his connected load. Thus Mr. Taunton's suggested lighting load of 10 A on a two-way or three-way splitter becomes permissible.

That the Rule might have been more clearly stated is evident from the fact that Mr. Taunton admits his reluctance even to hazard a guess as to its meaning. ERNEST F. SMITH.

Dunfermline, *August 7th.*

Supply Management

Mr. Pointon's letter in your issue of July 28th raises some items of such importance that I expected that someone else would have dealt with them. He speaks of "much evidence of the appalling mismanagement of undertakings by otherwise excellent engineers," and explains that many undertakings are selling on two-part tariffs at such low rates that they have to be subsidised by flat rate and industrial consumers.

I remember in the early days, when 6d. per unit was the standard flat rate, people thought that industrial supply was subsidised by the flat rate users, but undertakings did not pay well even with the 6d. per unit price. Since then the price has gone down enormously and the financial position of the industry is excellent. The occasional recent increases in prices for electricity and gas are due to the great increases in the cost of coal and also in rates. The gas industry has also seen the advantage of the two-part tariffs and is using them, with advantage.

The effect of rates on the price of electricity is not understood by business men; they seem to think that they can take as much money as they wish from the prosperous electricity undertaking and that it should have no effect on charges. One man told me that the undertaking (municipal) should pay interest and sinking fund, put by money to replace old plant without raising further loans, provide public lighting at very low prices, pay liberally towards the rates and sell electricity cheaply to consumers. He was annoyed when I told him that it was impossible to do all these things.

It is time that technical managers took these matters up and showed their critics that a great deal of criticism arises from ignorance of the facts. M.I.E.E.

August 5th.

Locating Cable Faults

Mr. Thomson seems to have overlooked that my recent article on the above subject emphasised the fact that the difficulties of fault localising are the practical difficulties; I did not advocate the Murray loop test as the "cure all" for distributor—or feeder—faults; there are circumstances when it is advisable to use this test, and others when it is futile to do so.

The art of fault localising lies in the ability to discern the method most likely to prove efficient in the circumstances.

Perth, *August 4th.* W. WOODIWISS, A.M.I.E.E.

Iron Technology

You may possibly be interested in the following, which I overheard while waiting to be served in a Birmingham ironmonger's premises.

A young lady was purchasing a new electric iron to give as a wedding present. She eventually chose a "streamlined" pattern and asked a few questions about it. The salesman told her that when testing for heat she should hold it near the face or arm, "On no account wet the hand and touch the bottom of the iron, as this increases the voltage three times the amount."

Naturally, the customer asked what happened with damp articles, and he replied that they did not affect the iron. Then pointing to the three-core flex he said: "If anything does go wrong that third wire stops you getting a shock; it blows out." OBSERVER.

July 28th.

Heater Efficiency

A REPORT on comparative heating tests, issued by the "Thermovent" technical department of E. K. Cole, Ltd., contains data on the relative efficiency of different methods of electrical space heating and on the calculation of heat losses for combined radiation and convection systems. The report indicates that there are four main causes for the extra heat losses of the combined types (including all low-temperature panels and tubes) which are said to consume from 20 to 60 per cent. more electricity than pure convectors of the Thermovent type. First, there is the "radiation A" loss due to direct radiation through glass windows and roof-lights, estimated at from 5 to 20 per cent. of the total heat radiated, according to the amount and disposition of the glass.

Secondly, there is the "radiation B" loss, due to the absorption of radiant heat by the walls and other surfaces. This varies too widely for general quantitative evaluation, but it is not the least of the losses. The third is the "conduction" loss due to direct transmission of heat through the wall immediately adjacent to the heaters, *i.e.*, the heat loss co-efficient should be based on the wall temperature at this point, and not on the average temperature of the space heated. The extra losses from the wall immediately adjacent to a bank of three 10-ft. tubes amount to as much as 3½ per cent. of the total energy consumed.

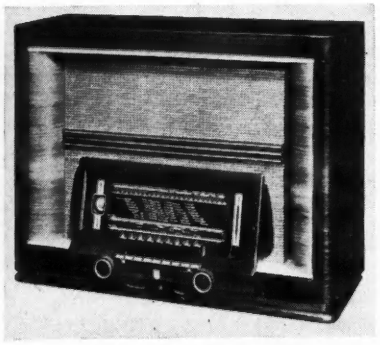
Finally, there is the "convection" loss due to absorption from the layer of convected hot air rising up the face of the wall from the heater. For the same bank of tubes, the tests showed a net increased loss of heat amounting to 5½ per cent. of the total energy consumed. These extra losses apply to a lesser extent to convectors unless they are so constructed as to (a) retain a cool outer casing, thus avoiding losses 1, 2 and 3, and (b) emit the heated air at high velocity away from the wall-face, thus avoiding loss 4. With the Thermovent multiple duct assembly, it is claimed, these losses are eliminated. The full report is available, on request, from E. K. Cole, Ltd., Southend-on-Sea.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Improved Radio Receivers

BETTER quality of reproduction has been the main aim in the design of the 1940 range of radio receivers made by PHILIPS LAMPS, LTD., Century House, Shaftesbury Avenue, London, W.C.2. This has been accomplished mainly by a low-loss back coupling circuit which is now incorporated in all the mains models. The amount of back coupling produced depends upon the setting of the volume control. Thus when the control is turned up for weak stations the back coupling is reduced and full sensitivity is preserved.



Philips Model 735 receiver

Another interesting change is the tone control, which is of new design. In the old models the high frequencies were by-passed to earth *via* a condenser, with the result that a considerable part of the middle frequencies also disappeared. Now a proportion of the higher frequencies, which are cut off by a filter, is led by a back coupling circuit to the grid of the output valve, giving a much sharper cut-off at 1,800 c/s with the control fully in, whereas in the old model attenuation commenced at 500 c/s.

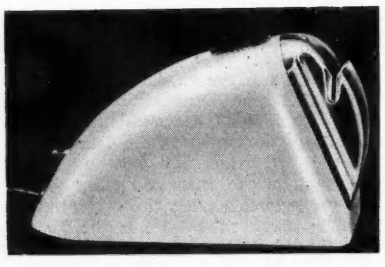
Other improvements include extended wave-band coverage down to 13 m. and considerable improvements in the DC/AC convertor unit of model 855X which, unlike the other types, cannot be supplied with universal valves.

There are six mains receivers (two console) and three battery models, the undistorted output of the mains receivers being from 3.5 to 4.0 W, according to model. Motor-driven push-button control has given way to a mechanical action.

Electric Knife Sharpening

A knife sharpener designed on tool-room principles is a rarity by comparison with the orthodox two-sided grinding methods usually resorted to, which generally produce a too-thin wedge-shaped cutting edge that is soon blunted by rubbing off the serrated fringe.

The superiority of the "Berkeley" machine is claimed to result from the fact that one side only of the blade is ground. A chisel-like edge is thus formed with a solid metal back which makes it strong and lasting; also the single-sided bevel is formed with a wide angle by removing the least amount of metal, so that the total wear after repeated grindings is much reduced.



Berkeley electric knife sharpener

Excessive temperature, which may easily soften the temper or burn the blade-edge, is avoided by the use of a specially made grinding wheel which minimises friction. It is composed of a fine-grained abrasive bonded with a bakelite substance, and in the wheel face are concentric grooves. Into these project steel guide prongs which are so dimensioned and shaped as automatically to preserve the correct grinding angle across the diameter of the wheel, no matter how worn the latter may be. The optimum angle of the edge is thus automatically maintained, so that the sharpening performance of the machine remains uniformly constant throughout the life of the grinding wheel. Incidentally, the guide prongs serve to remove any burr formed at the back of the cutting edge and also prevent the motor being stalled by over pressure on the blade within the grinding slot.

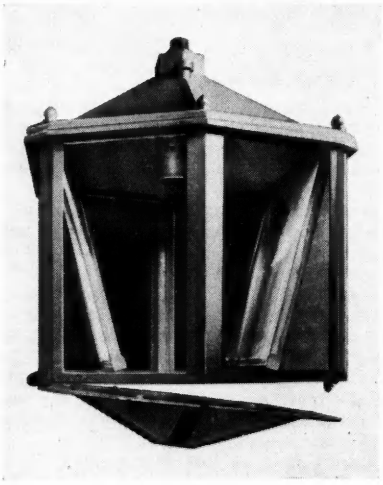
The small driving motor, AC or DC, is of a well-known make and specially designed for a definite constant speed to enable the wheel to do its work properly. It has a dust-proof shaft gland with ball bearings and is protected by a centrifugal switch in addition to the usual on-off switch. The base and motor cover are made of rustless metal, enamelled, while the plated end-cap and abrasive wheel are removable with the simple aid of a screwdriver. Over 20,000 knives can be ground before the wheel needs to be changed.

Total enclosure protects the user while the knife to be sharpened is drawn once through the grinding slot. This is done by hand and is not a skilled operation, while the pressure applied to the knife and the speed at which it is drawn through the slot may both be varied considerably. Blades cannot be harmed, provided they are not held stationary within the slot, and more than 800 stainless steel knives of all shapes and sizes can be so sharpened in an hour without scratching or otherwise damaging their polished surfaces under any circumstances.

The machines are offered in three sizes to such large scale users of cutlery as hotels, restaurants, canteens, shipping companies, hospitals and similar institutions, the smallest one being suitable for small hotels, cafés, large households, &c. They can be supplied for any voltage or frequency and have a three-core cable for earthing. They are manufactured by British Emulsifiers, Ltd., Hanworth, Middlesex, and the sole distributors are HOTEL AND CATERING UTILITIES, LTD., First Avenue House, High Holborn, London, W.C.1.

General-purpose Street Lantern

A general purpose lantern for street lighting has been developed by the BRIGHTON LIGHTING & ELECTRICAL ENGINEERING Co., St. Martin's Place, Lewes Road, Brighton. It is designed to take various lamps — metal filament up to 1,500 W, vertical burning mercury, or up to four 60-W vertical burning sodium lamps.



"Bleeco" street lantern

The lantern is specially suitable for use on inclines as the inside refractors are adjustable so that the main beam can be thrown parallel to the incline. The two front panels have been omitted in the illustration to show the fixing arrangement which is employed for the inside refractor panels.

Electric Fires

A newcomer to the domestic appliance field is the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Tyseley, Birmingham, which has for many years specialised in switch, fuse and motor control gear.

The new products are electric fires of which five models are available in 1- and 2-kW sizes. They are low-priced and of very sturdy cast construction, both the castings and the refractory material (all except one are non-reflector fires) being manufactured in the company's own works.

The "Memphis," a period model, and the "Mayfair," of more modern design, are both available in a number of coloured finishes. The reflector fire is the "Reflex," with bronze, cream or black cast-iron sides and a chromium-plated reflector. All portable models are fitted with a carrying handle at the back specially shaped so that the flexible cable can be wound round it when the fire is not in use. In addition, there

M. E. M. "Mayfair" and "Reflex" fires

is a flush-fitting 2-kW inset fire and a 1-kW surface mounting fire, somewhat similar in design to the "Mayfair."

BRITISH EAST AFRICA

Electrical Development and Prospects

(From a Nairobi Correspondent)

THOUGH steady progress is being made, the use of electricity is as yet in its infancy in the British East African territories of Kenya, Uganda and Tanganyika. This area comprises nearly 700,000 square miles and has a population of some 12 millions of which, however, only a handful are Europeans. Generally speaking, the African, who is essentially an agriculturist and pastoralist living in primitive, though steadily improving, conditions, takes as yet but little interest in the achievements of the electrical industry but the needs of the European community are augmented by the requirements of a not inconsiderable East Indian element.

The generation and distribution of electricity for public and private purposes in the territories in question is in the hands of private enterprise under licence from the respective Governments. The East African Power & Lighting Co., Ltd., of Nairobi, operating in Kenya and Uganda with associated companies in Tanganyika Territory, has generating stations in Nairobi, Mombasa, Nakuru and Eldoret, Kenya; Dar-es-Salaam, Tanga, Tabora, Dodoma, Kigoma, Moshi and Mwanza, Tanganyika Territory; and Kampala and Jinja, Uganda, the seat of the Government, Entebbe, being supplied from Kampala.

In addition, the Kenya Co-operative Creamery, Ltd., generates and distributes electrical energy, under licence, at Thomson's Falls, some small plants are operated by private landowners for working factories on, for example, sisal and tea estates, while private plants, usually for domestic lighting purposes, are owned by residents in remote situations.

An idea of the somewhat limited extent of the demand for electricity can be gathered from the fact that the East African Power & Lighting Co., Ltd., and its associated companies supply approximately an aggregate of only 11,000 consumers.

The area served from Nairobi is extensive and embraces in one direction Limuru, a distance of twenty miles, as well as Athi, 15 miles away, and the popular and growing districts of Karen and Kyambu, both about 8 miles from Nairobi. While the Karen district is being developed as an attractive residential area, Kyambu is known as the best coffee-producing district in Kenya and as such affords a demand for power for estate factories in which the coffee bean is processed.

Hydro-electric Plant

Good use has been made of rivers to supply electrical energy. In Kenya, the needs of the Nairobi area are met by means of two hydro-electric stations on the Maragua River (4,000 kW and 400 kW), supplemented by a hydro-plant on the Thika River (2,000 kW) and a 606-kW stand-by oil-engine plant. In Tanganyika territory a hydro-plant with an output of 5,000 kW operated since February, 1936, and owned by the Tanganyika Electric Supply Co., Ltd., on the Pangani River supplies current to the township of Tanga and the surrounding district in which are situated smaller townships and a considerable number of factories for the decortication of sisal. Small privately owned plants also use this river to generate power for sisal factories. Power for the township of Moshi and for industrial purposes in the neighbourhood is obtained from a plant on the Kikuletwa River.

The Dar-es-Salaam plant comprises four oil engines direct coupled to four 3,300-V 1,234-kV alternators. At Mombasa fuel oil, coal and coffee parchment—the outer skin of the coffee bean—are used as fuel for an installation consisting of a 1,500-kW steam turbine set, and five oil-engine generating sets, as stand-by plant, with an aggregate of 1,100 kW. The new plant at Kampala (Uganda), opened in 1938, comprises two boilers using wood fuel and two 500-kW turbo-alternators.

The system operated by the power companies in Kenya and Uganda is AC 3-phase, 4-wire, 50 cycles, at 415 and 240 V. The original supply in Dar-es-Salaam was DC at 440 and 220 V, but conversion to British standard AC is being effected and should be complete by the end of the year. In Dodoma and Kigoma the system is 230 V DC and current is supplied only between 6 p.m. and midnight. At Tabora the supply is AC at 380 and 220 V, 3-phase, 4-wire.

Of outstanding importance among recent electrical works is the scheme to supply from central power stations electricity for distribution in the Uganda Protectorate, *i.e.*, in Kampala, the commercial capital; Entebbe, the seat of Government, and Jinja, where the Nile at the Ripon Falls leaves Lake Victoria on its journey of some 3,000 miles to the Mediterranean. The mains supply was first utilised in Kampala and Entebbe in March, 1938. The new plant at Jinja (Uganda) which is not yet on load consists of two steam engines and two 50-kW alternators. Provision of a third unit (100 kW) is in hand.

Electrical Imports

Kenya and Uganda form a single administrative unit for purposes of Customs. Electrical imports other than telegraph and telephone instruments and wireless apparatus are classified under one or other of the following items:—Machinery and parts, goods and apparatus, wires and cables, lighting accessories and fittings, and light bulbs.

The Customs authorities in Tanganyika territory adopt a very similar classification but "accessories and fittings" are comprised in the item "Electrical goods and apparatus, n.e.s."

Of aggregate electrical imports valued at £232,243 in 1937*, the share of the United Kingdom was nearly £180,000, or 77 per cent. of the total and imports on Government account from the United Kingdom slightly exceeded £25,000, or about 11 per cent. of the total value of imports. With the possible exception of lamps, the position of the United Kingdom is not seriously assailed in any of the commodity groups. Cheap imports from Japan, especially of small lamps for hand torches, &c., gives to that country a large share of the lamp imports by number, as opposed to value.

The main use to which electricity is at present put in East Africa is lighting, both public and private. Industrial plants requiring power are few but increasing and the needs of a large meat-canning factory, opened in 1938, provided the motive for the construction of a line to Athi, 15 miles from Nairobi. Much attention is now being paid to industrial development, especially in Kenya, and the forward-looking policy of the licensees ensures ability to meet the increasing demands which may be expected.

At the four main stations, Nairobi, Tanga, Mombasa and Dar-es-Salaam, the peak load occurs during daylight hours. In Nairobi, the railway workshops, sisal estates, the principal coffee curing works, the new sisal bag factory at Ruiru, the Limuru tea factory and various cereal mills provide a load exceeding that taken for lighting and domestic purposes. In Mombasa the wharf, cranes, coffee works and other mills, in Tanga some thirty sisal factories and small mills, and in Dar-es-Salaam the railway workshops and cereal mills throw the balance of peak load towards morning and afternoon. A similar trend is already noticeable in Kampala and in general the small European and wealthy Indian population so limit the lighting demand that in practically all undertakings the power load outbalances the lighting demand at a very early stage in the life of the undertaking.

Largely perhaps because native domestic servants are unaccustomed to the proper and economical use of electricity, domestic appliances are not yet in general demand, except in Nairobi, where living conditions approximate to European. Until such time as actual and potential users increase in number the sale of such appliances must necessarily remain limited. For climatic reasons the demand for certain appliances such as domestic refrigerators is good while for electric fires it is negligible.

Industrial development has not yet reached an advanced stage in the East African territories and there is no local production of electrical goods of any kind. Apart from other considerations, the demand has not yet attained proportions which might afford economic justification for local manufacturing.

Methods of Doing Business

Local representation is usual. In the case of heavy equipment, *e.g.*, generating plant, the associated power companies in British East Africa order through their London office. Owing to the limitations of demand there is but little specialisation in distribution in British East Africa of electrical accessories and appliances, apart from the power companies which engage in wholesale and retail trade as well as electrical contracting. A few firms, mostly retail, import wire, fittings, domestic appliances, &c., and generally make use of the services of a shipping or confirming house in the United Kingdom.

(*Concluded at foot of next page*)

* Details of this trade were given in the ELECTRICAL REVIEW of Dec. 16, 1938.

NEW BOOKS

Plant Faults and Repairs. Small Motors. Elementary Physics

Faults and Failures in Electrical Plant. By R. SPIESER. (Pp. 408; figs. 218). Sir Isaac Pitman & Sons, Parker Street, Kingsway, London, W.C.2. Price: 30s.

THIS is not a textbook but a very practical help to the engineer in charge of heavy plant. It deals with the causes and results of trouble, and details both cures and preventive measures. In preparing the work, which is excellently translated from the German by Elaine Hunking, of the Metropolitan-Vickers Electrical Co., Ltd., the author has had the co-operation of a number of engineers of the Brown Boveri Co., Ltd., whose practical experience is freely drawn upon, thus providing material not, we imagine, previously collected in book form. The arrangement and sub-titling are well devised to facilitate ready reference.

The main parts deal with dynamo machines, transformers, auxiliary apparatus and materials, comprising altogether forty chapters with some 200 sub-headings. No space is wasted in dealing with ordinary textbook matter. Symptoms of trouble are described, traced to their actual cause, and methods of repair and prevention such as can be carried out on site, with the apparatus and instruments which might be expected to be available in a works or generating station, are described. Repairs which require the removal of machinery to the makers' works are not dealt with.

Not the least interesting section is that dealing with materials and their failures under such headings as mechanical stresses, fatigue, insulation breakdowns, oils, greases, bearing metals, solders, fibrous materials, and so on.

Practical engineers will find in this book just the sort of things which they habitually talk of when they meet together, and a refreshing absence of the things they are supposed to have learned at school.—H. M.

Fractional Horsepower Electric Motors. By C. G. VEINOTT. (Pp. 431; figs. 314). McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Price: 21s.

The preface to this work states that its aim is to tell the story of fractional horsepower motors, what types are available, what makes them run, what they will do, and how to repair them when it becomes necessary. The author proceeds to carry out this aim in a very thorough manner in the twenty closely written and well illustrated chapters which comprise the book.

The book opens with a chapter entitled "The Story behind the Nameplate" which describes the meaning of the various symbols and other information. Then follow chapters on the principle of the induction motor, induction motor windings, split-phase motors, and capacitor motors. Not only are the well-known types dealt with in detail, but also a large variety of less familiar designs.

Further chapters are devoted to repulsion-start, repulsion and repulsion-induction, universal, shaded-pole, polyphase, synchronous and synchronous-drive, and direct-current motors. Constructional details are dealt with in a long and particularly well illustrated chapter, followed by one on testing. The book concludes with a trouble diagnosis chart of especial use to the maintenance and repair man.

Although the volume is written mainly from the practical point of view each chapter concludes with a useful bibliography. The work can be recommended to all concerned with FHP motors, whether designers, manufacturers, repairers or users, as giving an authoritative review of the vast range of these machines now available, and fills a long felt want. Although it deals exclusively with American practice, its value to the British reader is not thereby lessened. The majority of curves and tables relating to AC motors are, however, based on machines wound for the American standard frequency of 60 cycles and may require adjustment for 50-cycle conditions.—S. F. P.

Introductory College Physics. By P. L. ROGERS. (Pp. 487; illus.) Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price: 12s. 6d.

This elementary textbook, by an American author, is written on the conventional plan of division of the subject into sections on mechanics, molecular physics and heat; vibrations, wave-motion and sound; light, electricity and magnetism; and "the new physics."

In the choice of facts employed for illustration of fundamental principles there is, however, a far from usual and very good balance between the old and the new, between, on the one hand, simple demonstrations and historical anecdotes, and on the other hand appeals to modern methods and to units of modern machines and their behaviour. The resulting blend is as good as anything of its kind which we have seen.

Previous knowledge assumed is almost nil, particularly in mathematics. It is not, therefore, possible to cover in the four hundred odd pages all that is usually regarded as being necessary in an intermediate physics course of British universities, particularly for engineering students, for whom the precision of mathematical formulation is important. A surprising number of results are, nevertheless, derived, with sufficient attention to detail, and as a preliminary general survey of physics, suitable for use in preparation for a matriculation examination, or in the middle forms of schools, the book may be recommended wholeheartedly.

The type and illustrations are excellent, there are numerous review questions and problems, and a full index. K. G. E.

Shorter Notices

To the instructive series of Post Office "Green Papers" there has been added No. 46D, a 44-page history of the P.O. Engineering Department, illustrated with 33 photographs and drawings by that Department and the G.P.O. film unit. In telling the story of the organisation of which he is a member, Mr. E. C. Baker, in effect, reviews concisely the history of electrical communications in the British Isles, at the same time presenting glimpses of P.O. engineers' pioneer work in the initial stages of modern electrical industry. So eventful has been the period since the State formally took over the electric telegraphs from private companies in 1870 that the possibilities of the next seventy years seem almost beyond contemplation.

"Engineering Drawing," by A. Cryer. Fourth edition. (Pp. 156; illus.) Price: 5s. "Automobile Engineering," edited by H. Kerr Thomas. (About 1,750 pages; illus.) In seven volumes at 7s. 6d. each. "Theory and Practice of Alternating Currents," by A. T. Dover. Third edition. (Pp. 590; Figs. 326.) Price: 18s. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2.

"Essentials of Alternating Current," by W. H. Timbie and H. H. Higbie. Second edition. (Pp. 377; figs. 249.) Price: 11s. "Industrial Electricity (DC Practice)," by W. H. Timbie. Second edition. (Pp. 632; illus.) Price: 15s. "Direct Current Machinery" by H. S. Bull. (Pp. 314; figs. 193.) Price: 15s. "High Frequency Alternating Currents," by K. McIlwain and T. G. Brainerd. Second edition. (Pp. 530; fig. 225.) Price 30s. "Electrolytic Condensers," by P. R. Coursey. Second edition. (Pp. 190; figs. 112.) Price: 10s. 6d. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2.

British East Africa (*Concluded from preceding page*)

The Customs tariff of Tanganyika territory is identical with that of Kenya and Uganda. Owing to international treaty obligations, no British preference exists and dutiable items are subject to one tariff rate no matter what their origin. The basic rate of customs duty is 20 per cent. *ad valorem*, but each of the East African territories in question admits free of duty machinery or equipment for productive purposes, while materials for the use of industry are admitted free or at a rate less than the basic rate. Imports on Government account are not liable to duty.

In the circumstances described, "Machinery, apparatus, appliances and instruments (not including tools, or domestic or toilet machines, or appliances elsewhere provided for) and electrical material used in connection therewith, for the generation, storage, transmission, distribution of, or lighting by, gas or electrical power and parts thereof, but not including electroliers, gasoliers, lamps, lamp-shades or reflectors, portable batteries or electrical appliances for use in connection with vehicles," are admitted free of duty, whilst appliances for domestic use are dutiable at 20 per cent. *ad valorem*, except refrigerators which are at present admitted free of import duty.

The unit of currency is the East African shilling, divided into 100 cents. The notes and coinage are issued by the East African Currency Board and the exchange value of the currency is maintained at a parity with sterling by the operations of that Board.

Apart from plans for the construction of a hydro-electric generating station at Nanyuki, Kenya, by the owners of the plant at Thomson's Falls, no new schemes are known to be under consideration or in contemplation. The construction of a storage dam on the Tana River and the extension of the Tana-Maragua station are being considered subject to satisfactory terms being arranged with Government.

As a market for electrical equipment and appliances, the East African territories will remain of modest proportions until such time as industrial development or settlement schemes lead to a marked increase in the number of consumers but consumption of electricity records an advance with each year that passes and the demand for appliances is bound to grow.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

WEST BROMWICH Corporation Electricity Committee has recommended **Mr. R. C. Golding,** of Bristol, for appointment as mains engineer at a salary of £511 per annum.

In our last week's issue we announced that **Mr. R. Smith,** A.M.I.E.E., had rejoined Tricity Cookers, Ltd., as sales manager, and we now reproduce his portrait. Prior to 1920 Mr. Smith was for some time chief assistant engineer with the Worcester Corporation Electricity Department.

Mr. R. Smith

Mr. F. Le Neve-Foster, who has been appointed to the board of Crompton Parkinson, Ltd., is a member of the firm of Warren, Murton, Foster & Swan, solicitors, and has been associated with the company for many years. He is also a director of the Stanton Ironworks Co., Ltd., and other companies.

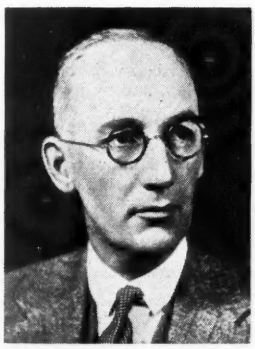
Birkenhead Corporation Electricity Committee has appointed **Mr. H. Campbell,** of Nelson, as meter superintendent at a salary of £379 a year.

Worksop Council have confirmed the appointment of **Mr. G. R. Laithwaite** as borough electrical engineer and manager in succession to Mr. M. S. Mason who has resigned. Mr. Laithwaite is at present deputy electrical engineer. A native of Wigan, he joined the staff of the Worksop undertaking in 1931.

Mr. T. S. Rowden has been recommended by the board of Rawlings Bros. for the appointment of joint managing director with Mr. W. R. Rawlings, and it is also proposed to appoint **Mr. W. J. Rawlings** and **Mr. R. J. Rawlings** as additional directors. The recommendations will be submitted at the annual meeting of the company on August 16th.

Mr. J. Jeynes and **Mr. A. Stokes** have recently retired after twenty-three years' and forty years' service, respectively, at the Worcester electricity works. Mr. C. M. Shaw, city electrical engineer, made presentations to Mr. Jeynes (watch and cheque), and Mr. Stokes (cheque).

Mr. J. S. Simmons, joint advertising manager of W. T. Henley's Telegraph Works, Co., Ltd., and advertising manager of Henley's Tyre & Rubber Co., Ltd., was unanimously elected a Fellow of the Incorporated Advertising Managers' Association at its council meeting on July 27th. The honour was awarded in recognition of his services to advertising management generally, and particularly to the Association.



Mr. J. S. Simmons

Mr. R. A. Woods, B.Sc., A.M.I.E.E., has been appointed distribution engineer to the West Midlands Joint Electricity Authority, in succession to Mr. J. A. Sumner, who, as we have already reported, has been appointed deputy chief engineer at Derby. Mr. Woods received his general education at Nottingham High School and his technical education at the University College, Nottingham. He joined the staff of the Derbyshire and Nottinghamshire Electric Power Co. in September, 1926, and two years later was appointed technical assistant on the head office staff of that company. In March, 1931, he went to Wolverhampton as technical assistant (distribution) on the head office staff of the West Midlands J.E.A.

Lieut.-Col. C. E. Mackellar has resigned the position he has held for many years with Johnson & Phillips, Ltd., in order to join the board of Westool, Ltd. He has had a long experience in the electrical industry, and prior to his association with Johnson and Phillips acted as sales engineer to Veritys, Ltd.

Mr. L. W. G. Hetherington, manager of the Malden electricity showrooms of the Wimbledon Corporation, was married recently to Miss Joan Winifred Partridge.

Bexhill Town Council has promoted **Mr. E. A. Neal** temporarily to the position of technical assistant in charge of mains and sub-stations, and has agreed that if he obtains the appropriate technical qualifications within twelve months the appointment shall be made permanent.

Mr. A. F. Douglas has been appointed manager for Scotland by Drake & Gorham Wholesale, Ltd., in succession to Mr. J. H. Scott, who has acted as their agent since 1923. Convenient stores and offices will be opened at 182, St. Vincent Street, Glasgow, on September 1st (telephone No. Central 2819).

Mr. A. F. Douglas

Ashton-under-Lyne Corporation has appointed **Mr. N. Jones,** A.M.I.E.E., to the vacant position of assistant mains engineer in the Electricity Department.

Presentations, including a bureau, were made recently by the staff of the Liverpool Public Lighting Department to **Mr. R. E. Rogers,** who has retired from the position of deputy city lighting engineer. Mr. P. J. Robinson, city electrical and lighting engineer, presided at the ceremony.

OBITUARY

Mr. Ll. B. Atkinson.—It is with deep regret that we learn as we go to press of the death of Mr. Llewelyn Birchall Atkinson, Advisory Director of the Cable Makers' Association, which occurred on Wednesday last in his seventy-sixth year. We hope to deal fully with Mr. Atkinson's career in our next issue.

Mr. S. D. White.—We regret to announce the death on August 6th at the age of sixty-five of Mr. S. D. White, a director of the General Electric Co., Ltd. Mr. White commenced his career with the G.E.C. in 1888, and during last year he was presented with a silver salver by Lord Hirst and his colleagues on the board to mark the completion of fifty years' service with the company. Soon after the G.E.C. moved from the original premises in Great St. Thomas Apostle to Queen Victoria Street, Mr. White was transferred to the staff of the counting house, and in 1894 became manager of the bell department. Later he became manager of the government and railways department, and among the other departments in which he had a controlling interest were the bell, telephone and radio departments. He was elected a director of the company in 1915. Mr. White was also a director of the Pirelli-General Cable Works, and of the Carmarthen Electric Supply Co. The funeral took place yesterday (Thursday) at Surbiton.

Mr. E. P. Barfield.—The death is announced of Mr. Eric P. Barfield, chairman and managing director of Wild-Barfield Electric Furnaces, Ltd., which occurred on August 7th after a short illness.

Mr. S. C. Bartholomew.—We regret to have to record the death of Mr. Sydney Charles Bartholomew, M.B.E., M.I.E.E., which occurred on June 30th. Born in 1873, Mr. Bartholomew received his training in the Central Telegraph Office and the Engineering Department of the General Post Office. In 1911 he was appointed assistant engineer, in 1920 became executive engineer, and in 1927 was appointed assistant staff engineer, which post he held until his retirement under the age limit of sixty years, after forty-three years' service. Mr. Bartholomew was well known for his work on power circuit interference with telephone and telegraph lines; corrosion and electrolysis, in connection with which he gained an international reputation. He was also the author of a number of papers dealing with these subjects. He was awarded the M.B.E. in 1932.

Lafayette

The late Mr. S. C. Bartholomew

Mr. J. Hall.—We learn with regret of the death on August 3rd at Southsea of Mr. J. Hall who retired on June 30th, 1936, after completing forty-nine years' service with W. T. Henley's Telegraph Works Co., Ltd. Mr. Hall and his father had worked a total of ninety-five years with William Thomas Henley and the present company, and their experience in submarine cable laying work included some of the most important cables in existence.

COMMERCIAL and INDUSTRIAL NEWS

Technical Training of Youths. G.E.C. Chinese Headquarters. Electric Lamp Imports. Beet Sugar Factory Electrification. Wash Boiler Factory

Training Youths from Distressed Areas

REMARKABLE success has attended a scheme initiated by the Electro-Dynamic Construction Co., Ltd., with the help of the Commissioner for Special Areas, for the technical training of youths from distressed industrial districts in South Wales, Durham, Cumberland and Scotland in its factory at St. Mary Cray, Kent.

When the scheme was first started about two years ago, whole families were brought to St. Mary Cray and accommodated in a double bungalow adjacent to the factory, but later it was thought preferable to provide a hostel for the youths under the charge of a qualified matron. With this latter building erected the company is able to take thirty-four trainees at a time. These come to the factory beween the ages of fifteen and seventeen and stay for two or three years. After one to three months' trial they are given normal apprenticeship indentures, and during the whole of their training receive wages—22s. a week for the first two years and 23s. for the third and fourth, these sums including Ministry of Labour grants. From these wages are paid board and lodging, savings for holidays, &c., leaving about 2s. a week pocket money. Extra payment for overtime is allowed on time and piecework.

All the trainees go to night schools, where free tuition is provided, and most of them join the works sports club, which for a penny a week gives them facilities for football, cricket, boxing, &c. The local branch of Toc H has taken an interest in the lads, too, and arranged for cheap swimming for them at the local open-air baths. Mr. Pensabene Perez, the managing director of the company, who takes an almost paternal interest in the boys, is most enthusiastic about the scheme. The healthy surroundings and the qualified medical supervision provided, he tells us, have worked wonders in the health of the boys, who benefit, too, by the discipline enforced. Already some have been absorbed into the factory and others have secured good jobs elsewhere.

New E.A.W. Branch

A branch of the Electrical Association for Women for South Staffordshire and North Worcestershire has been formed. The recent inaugural meeting at Tipton, presided over by Councillor Mrs. Williams, had a good send off; the speakers included the Mayor and Mayoress of Tipton (Ald. and Mrs. A. F. W. Welch), Miss C. Haslett (director, E.A.W.), Mrs. C. Heathcock and Mrs. Hyde (chairman of the Birmingham branch of the Association). The company numbered nearly 200. The officers and a committee were appointed, with Miss A. Mitchell as honorary secretary. The president is Mrs. G. G. Heathcock. Mr. C. Heathcock, managing director of the Midland Electric Corporation for Power Distribution, Ltd., acknowledged the services of those who had taken part in launching the new branch.

The Functions of the Merchant

The London Chamber of Commerce set up a committee last year to investigate and report whether, and to what extent, movements existed in various trades tending to eliminate the merchant or prejudice his interests, and to make recommendations. The matter arose out of the direct sale of steel to consumers at a price lower than that charged to the stock-holding merchant. The committee, in its report which has been adopted by the Council of the Chamber, points out that so far from being "middlemen," merely collecting a commission on sales, genuine merchants fulfil a useful function and are able to market goods more cheaply and efficiently than can the manufacturer himself. Examples of this are quoted. It is maintained that manufacturers who have set up their own marketing organisations have usurped the function of the merchant at greater expense. The particular importance of the merchant in overseas trade is stressed. An appendix deals with the functions of the merchant in various trades.

The Committee recommends that its report shall be transmitted to the Government with a request that the merchant should be taken into consultation in discussion with Ministers or trade delegations from overseas.

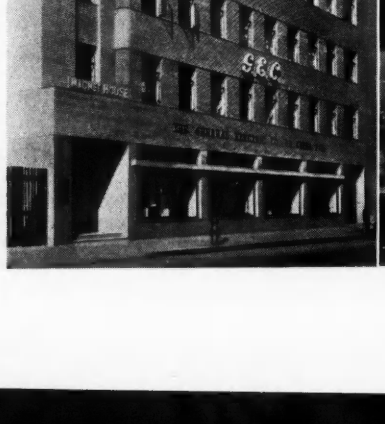
Glasgow and E.D.A.

Regarding the question of renewing Glasgow Corporation's subscription to the British Electrical Development Association (which amounts this year to £1,405), the manager reported to a recent meeting of the Electricity Sub-committee on Finance and Works that he had been unable to obtain information as to the amount spent by the Association in advertising and propaganda in Glasgow and the West of Scotland, but submitted details of the income and expenditure of the Association so far as Scotland generally was concerned. It was moved that the subscription be not renewed for the current year and that the Corporation withdraw from membership of the Association. It was also moved as an amendment that consideration of the matter be continued pending a meeting in Glasgow with representatives of E.D.A. On a vote, the motion that the subscription be not renewed was carried. At a subsequent meeting of the Electricity Committee the amendment continuing consideration of the matter pending representatives of the Association appearing before the Committee was carried.

New G.E.C. Shanghai Headquarters

In spite of the present troubled conditions in China, British manufacturers are pushing ahead with extensions. The General Electric Co. of China, Ltd., which has for many years occupied premises in Ningpo Road, Shanghai, now has new and imposing headquarters at 49, Szechuen Road, in a building which is in keeping with modern Shanghai. Sir Robert Calder-Marshall, K.B.E., chairman of the British Chamber of Commerce in Shanghai, and a director of the General Electric Co. of China, Ltd., assisted by Mr. N. G. Beale, managing director, and Mr. A. B. Raworth, director and general manager, recently entertained a large gathering to celebrate the opening of the new Magnet House, and among the 150 guests were H.B.M. Consul-General Sir Herbert Phillips, Mr. A. H. George, Commercial Counsellor to the British Embassy in Shanghai, and many other prominent citizens.

The new five-storey building houses large service departments. It is an impressive building by day, and by night the excellent lighting provided in the four large display windows by the company's "T.O.T." window lighting reflectors, together with the familiar G.E.C. trade-mark in neon, makes the new Magnet House an outstanding landmark in the



The imposing exterior of the new G.E.C. Shanghai headquarters and (below) the industrial fittings and refrigerator department of the new showrooms

neighbourhood. The main entrance gives immediate access to the public showrooms, which, by their display of lighting fittings, domestic and industrial electrical products, provide a striking exhibition of "everything electrical." A prominent feature is the installation of "Osira" fluorescent tubing for general lighting purposes. The display of lighting fittings is particularly comprehensive, and includes a wide range of designs suitable for the home and the office, with the latest type of industrial fittings for use with "Osira" high-pressure mercury vapour lamps. At the end of the showrooms a platform carries a range of "Coldair" refrigerators, while attractive display counters alongside the walls hold domestic appliances, radio receivers, and many other of

the company's products. Examples of installation material are mounted on panels fixed to the walls, and provide a quick source of reference for intending purchasers. Clever use has been made of the columns between floor and ceiling by building around their bases glass-fronted cases which provide still further space for the display of goods.

The vast range of products manufactured by the G.E.C. involves large stockroom facilities. In the new Shanghai headquarters these are situated at the rear of the premises and are approached on each floor by wide galleries, permitting easy and rapid handling of goods. Immediately below is the delivery van dock, equipped with a large revolving turntable for the speedy handling of the vans.

Trade Announcement

Maurice G. Parker, Ltd., have removed to 3, New Street, Birmingham. The telephone number remains unchanged.

Lamp Imports

In the House of Commons on August 2nd Mr. Groves asked the President of the Board of Trade if he would state the quantity of electric lamps, bulbs, tubing and rods used in such manufacture imported into the country during the past five years, giving each period separately, also separately state the quantities used for domestic, industrial and motor vehicle purposes, and whether he considered taking steps to prevent the continued importation of such articles.

Mr. R. Cross, who replied, said that the following statement showed such information as was available regarding the imports into the United Kingdom of the goods specified during each of the years 1934 to 1938 and during the first six months of 1938 and 1939:—

Description	1934	1935	1936	1937	1938	Jan. to June, 1939
Glass tubing and rod for all purposes ...	cwt. 7,024	cwt. 8,856	cwt. 6,914	cwt. 8,950	cwt. 8,953	cwt. 6,366
Glass bulbs for electric lamps ...	Thous. 21,964	Thous. 32,518	Thous. 38,882	Thous. 41,213	Thous. 40,169	Thous. 18,304
Bulbs, complete, ready for use, 20 volts and over:						
Gas-filled	2,112	1,549	2,862	2,326	1,575	694
Other	6,355	1,816	3,414	4,750	2,968	714
Under 20 volts:						
For motor vehicles	7,264	8,105	8,904	8,166	9,743	3,254
For flash lamps ...	45,422	23,839	36,102	43,699	30,948	7,191
Other	2,213	4,494	3,523	4,164	6,088	1,085

N.B.—The figures for 1938 and 1939 are provisional.

During the current year there had been a substantial decline in imports of most of these goods, which were all subject to import duties. The President saw no reason for any special action.

Prices of Materials

Henry Gardner & Co., Ltd., report, August 9th: Copper bars (best selected), sheet and rod, £82, £2 increase. English pig lead, £18 5s., £1 increase. Spelter, no change. English block tin, no change. Mercury, no change.

Frederick Smith & Co. report, August 9th: Electrolytic copper bars, £51 5s., £1 10s. increase. Ditto, ditto, wire rods, £55 15s., £1 10s. increase. Ditto, ditto, h.c. wire, 8$\frac{3}{4}$d., $\frac{3}{16}$d. increase. Silicium bronze wire, 8$\frac{1}{2}$d., $\frac{7}{16}$d. increase.

Edward Till & Co., report, August 9th: India-rubber, Para fine, 7$\frac{5}{8}$d., $\frac{1}{8}$d. increase.

A Travelling Showroom

Henley's travelling showroom, which recently began an extended tour of the country, is a modern vehicle finished in green and black, and combines the best features of both passenger and commercial coach building. It is mounted on a Dennis two-ton petrol engine forward control chassis, fitted with Henley tyres. Samples of various types of wires, cables and flexible cords from small winding wires up to 132 kV cables are carried, in addition to a comprehensive range of distribution equipment, including the new Series 3 insulated house service fuses, overground disconnecting box units, fuse and link units for panel mounting and Sharborn relays. Sections of Henley tyres are also shown. It is anticipated that the complete tour scheduled will take about eight months, during which the van will visit the more important centres in England, Scotland and Wales.

Henley travelling showroom showing the effective lay-out of the interior

Eire Electrical Imports

Imports of various types of electrical goods into Eire during June are given officially as follows:—Motors, £5,495; power transmission equipment, £796; dry batteries, £998; parts of dry batteries, £200; electric lamp bulbs, £582; electrically heated apparatus, £673; lighting accessories, £4,747; wires and cables, insulated, £10,705; and cooking apparatus, £1,569.

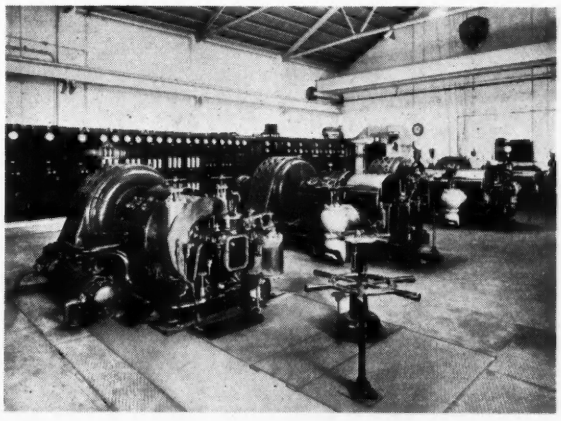
Equipment in a Beet Sugar Factory

Recent modifications and extensions to the plant of the British Sugar Corporation, at Bury St. Edmunds, have included the installation of several Crompton motors, switchgear and lighting units. To utilise some of the residues of the production process the beet from which the sugar has been extracted is separated from the surplus water by being passed through a screen press. It is then sprayed with molasses and dried to produce a cattle food, the season's output being sold before the factory starts.

Part of the drying is done by the flue gases from the boiler house, which are drawn through the pulp drying drum by a fan driven by a Crompton Parkinson 280-BHP protected type, endshield pattern, unity power factor, 1,000-RPM, 220-V autosynchronous motor.

For supplying steam for the turbines and certain processes in the factory there are ten Babcock & Wilcox chain grate boilers, operating at 285 lb. per sq. in. The turbines run at 6,000 RPM, but are geared down to 1,000 RPM, which is the speed of the Crompton alternators. The output of the three smaller sets is 500 kW each at 0.8 power factor, 220-V, 3-phase, 50-cycles, and that of the fourth set is 700 kW.

These machines are of open type with sleeve pedestal bearings. They are ventilated by air ducts from the outside atmosphere.



The power house of the British Sugar Corporation

The turbines exhaust steam at 28 lb. per sq. in. and this is used for process work on the evaporating plant. Other process steam is reduced from 285 to 60 lb. per sq. in. by means of a reducing valve.

These machines are directly connected to a flat-back enamel slate switchboard supplied by Crompton Parkinson, which distributes the power through feeders to the whole factory. This switchboard is mounted on angle-iron framework for floor and wall fixing.

The alternator panels are equipped with ammeters, power factor indicators, kilowatt-hour meters, reverse power relays and overload relays. The feeder panels are fitted only with oil switches and ammeters.

Owing to the heavy current dealt with and the long length of the switchboard, expansion joints have had to be fitted in the busbar run so that the expansion and contraction in the copper can be satisfactorily dealt with.

For lighting, Crompton Parkinson, Ltd., supplied "Duoflex" fittings for the silos and dispersive reflectors for the storage rooms.

Victorian Electricity Commission and Trading

The *Electrical Engineer & Merchandiser* reports that the Public Works Committee recently held an investigation into the proposal that the State Electricity Commission of Victoria should resume trading in appliances. The secretary of the Victorian Chamber of Manufacturers, Mr. P. C. Oake, stated that the Chamber held the view that, although the Commission was a semi-Government undertaking, it was a public utility, and it was difficult to advance commercially reasons why there should be any restriction on such of its activities as would be regarded as the normal activities of a similar utility controlled by private enterprise. Therefore, the Chamber did not express opposition to an extension of the powers of the Commission to enable it to engage in retail trading. But, while the Chamber did not offer opposition, it felt that a principle should be laid down that there should be no discrimination as between manufacturers, and that the Commission should be prepared to display and sell under the manufacturer's own brand any appliance produced locally which was regarded as efficient and satisfactory for the purpose for which it was designed. In regard to the question of manufacture, Mr. Oake said that he wished to record the Chamber's absolute opposition to the manufacture of goods for sale by the Commission.

New Wash Boiler Factory

To deal with growing business the Universal Boilers & Engineering Co., Ltd., has recently moved to larger premises at Fulledge Works, Burnley, where the up-to-date facilities available will assist considerably in the manufacture of the company's electric wash boilers and washers which are now marketed under the new name of "Versco."

The main factory block is a single-storey building with a floor area of over 36,000 sq. ft., the offices, administrative section, &c., being housed in a three-storey building adjoining. Tinning, acid cleaning, paint spraying, &c., are carried out in a small separate shed 4,000 sq. ft. in area. All the wash boilers are completely manufactured on the premises from raw materials and special machinery of the latest type has been installed for that purpose.

A special department is equipped to recondition and, if necessary, rebuild all makes of wash boiler. All the machinery is electrically driven and the "Thermolier" system of heating incorporates electrically driven fans. In the assembly bays, &c., an approximate illumination of 5.75 ft.-candles is provided by 300-W lamps spaced 20 ft. apart, while 100-W lamps 10 ft. apart give 6.25 ft.-candles in the machinery area. All the electrical work was carried out by the Burnley Corporation Electricity Department.

Lamp Production in Scotland

The British Luma Co-operative Electric Lamp Society's new factory at Shieldhall, Glasgow, jointly owned and controlled by the Scottish and Swedish Co-operative Wholesale Societies, will be officially opened on August 26th. Production commenced in December last and since then a staff of Scottish operatives has been trained and a stock of lamps built up, so that demands for all orders can be met immediately. Mr. D. Cameron Thompson, director of the S.C.W.S., will perform the ceremony. He is also chairman of the British Luma Lamp Society.

Radio-Interference-Free Mark

It was announced a few weeks ago that the British Standards Institution had registered a special certification mark which could be used under licence by manufacturers of electrical appliances which are inherently free from radio interference or which are fitted with suppressors so that the interference is within the limits laid down in British Standard Specification 800.

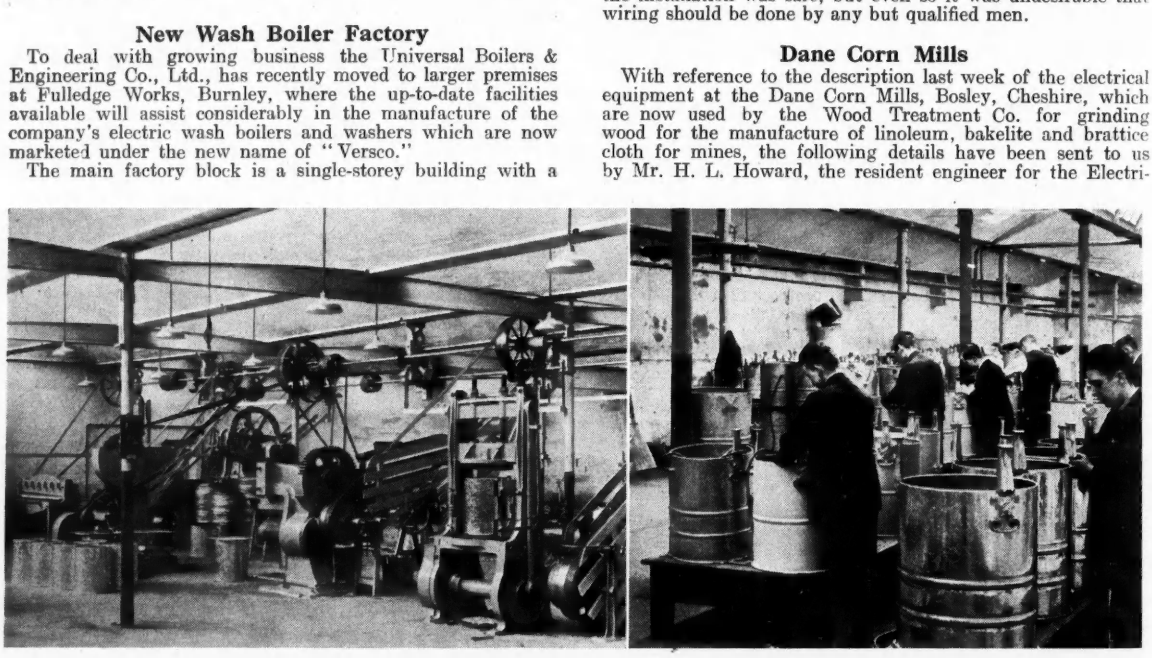
The British Standards Institution now announces that it is prepared to receive applications for licences for the use of this mark, and full particulars may be obtained on application to the Director, British Standards Institution, 28, Victoria Street, London, S.W.1.

Electrical Wiring at Rotherham

Ald. Ball referred at last week's meeting of the Rotherham Borough Council to an allegation that the Corporation, and particularly the Electricity Department, encouraged people to do wiring after they had finished their normal day's work, and Ald. Caine, chairman of the Electricity Committee, in reply, said that allegation did not apply to any employee of the Corporation, and no part-time or spare-time men had been engaged by the Department on any work whatever. The Corporation had no power to compel prospective consumers of electricity to have the wiring done by the Corporation workmen, or by other properly qualified electrical contractors' men, but for the sake of safety they should be warned not to encourage spare-time amateur electricians to do such work. The Electricity Department would not give a supply unless satisfied that the installation was safe, but even so it was undesirable that wiring should be done by any but qualified men.

Dane Corn Mills

With reference to the description last week of the electrical equipment at the Dane Corn Mills, Bosley, Cheshire, which are now used by the Wood Treatment Co. for grinding wood for the manufacture of linoleum, bakelite and brattice cloth for mines, the following details have been sent to us by Mr. H. L. Howard, the resident engineer for the Electricity Co. of Macclesfield, Ltd., which supplies electricity to the mills.



Special wash boiler making machinery at the new works of the Universal Boilers & Engineering Co., Ltd., and (right) assembly in progress

The 11,000-V line coming from Macclesfield ends at the side of the public highway on an ordinary "H" pole, and thence is continued by underground 11,000-V Pirelli three-core cable to a pole box at the top of the "H" pole shown in the picture which accompanied our note. Mounted on this pole on one side are three ground operated air-break G.E.C. switches, and three G.E.C. liquid fuses of the "Quenchol" type. Underneath the fuses is mounted a pole box, and a three-core cable connects this with the high-voltage side of a G.E.C. 300-kVA transformer, 11,000/400/230 V, three-phase. The low-voltage side of the transformer, as stated in our note, then proceeds underground to the low-voltage iron-clad switchboard which

ELECTRICITY SUPPLY

"Cold and Coal" Effects at Guildford. Lower Charges at Inverness. Sutton Coldfield Fixed Charge Basis

Banstead.—More Electric Lighting.—After a lengthy debate during which three amendments were defeated, the Council recently decided on further contracts for street lighting by electricity over a period of ten years with the London and Home Counties Joint Electricity Authority and the County of London Electric Supply Co., Ltd.

Barrow-in-Furness.—Reciprocal Supplies.—At a recent meeting of the Electricity Committee the electrical engineer reported on negotiations with Vickers-Armstrong, Ltd., with regard to reciprocal supplies of electricity. The company, he said, had now agreed to waive the standing charge of £1,000 per annum paid by the Corporation under the reciprocal agreement.

Sub-station Construction.—In connection with the bulk supply to the Cark Electricity Supply Co., Ltd., the Electricity Committee is to provide a sub-station at Cark at a cost of £1,112. In its own area the Electricity Committee is proceeding with the construction of a sub-station on the Greengate estate, involving an expenditure of £2,163.

Bewdley.—Electric Lighting Decision.—The existing street lighting at this Severn-side town is partly by gas and partly by electricity. Last week, however, the Council accepted a tender by the Shropshire, Worcestershire and Staffordshire Electric Power Co. for the whole of the street lighting during the next ten years at an annual cost of £330. The tender of the Bewdley Gas Co. was £467. The Mayor remarked that the Council much regretted cutting out a local concern, but they had to consider the ratepayers.

Blackburn.—Power Plugs in Houses.—Two power-plugs are to be installed in each of the 1,833 houses belonging to the Corporation.

Blackpool.—Loans for Equipment.—The Corporation is applying for sanction to borrow £36,000 for additional transformers and switchgear, £6,000 for new mains and £11,000 for the conversion of apparatus in connection with the change-over.

Bury St. Edmunds.—Street Lighting.—At a special meeting the Town Council has accepted the tender of the East Anglian Electric Light Co. for street lighting.

Cheltenham.—Safeguarding the Supply.—The erection of a new sub-station costing £1,624 as an alternative to the Rowanfield Road sub-station is proposed. The new building will provide a safeguard against serious interruption of the supply in the event of fire at the Rowanfield Road sub-station, and will also be a precaution against war-time damage.

Croydon.—Supply of Heating Equipment.—A proposal of the Electricity Committee to provide an installation of 84 hot-water radiators and pipework in various rooms of a block of flats, together with electric heating plant and a storage tank, was referred back by the Borough Council recently. Alderman Gibson said that the scheme "cut at the very root of business, so far as local contractors were concerned." Councillor Boddington, chairman of the Electricity Committee, replied that the whole of the work would be done by local contractors.

Contract for Generating Plant.—The Electricity Committee recommended, subject to the approval of the C.E.B. and the sanction of the Electricity Commissioners, that a contract should be prepared for two 30,000-kW turbo-alternators, condensing and auxiliary plant required for the new power station, and that the tender of £327,712 submitted by the contractors, whose name would be reported to the Council, should be accepted. During discussion it was contended that the work should be put out to tender, in reply to which Councillor Boddington said that the Committee's experience of putting these contracts out to tender was that they had to pay considerably more. The Committee's recommendation was approved.

Exeter.—Jubilee Celebrations.—The Corporation has approved a scheme of illuminations to cost £550 in celebration of the fiftieth anniversary of the town's electricity supply.

The cooling towers of the Leicester power station at Aylestone, on the outskirts of the city, have just been painted with designs of trees to camouflage them from the air

Formby (Lancs).—Reduced Charge.—The Council has made a reduction in the flat rate lighting charge under tariffs A and B from 6½d. to 6d. per kWh to take effect from the beginning of next quarter.

Guildford.—Cold and Coal.—How circumstances during the past year, for the most part quite exceptional, have affected the accounts in a way which illustrates very clearly the loss of elasticity entailed when increase of generating plant has to

Commercial and Industrial News (*Continued*)

was made up in the works of the Electricity Co. of Macclesfield. A similar high-voltage equipment is erected on the back side of the poles, thus forming a duplicate equipment to serve a second transformer. The erection of the line, which is of standard Pirelli construction, was carried out by the staff of the Electricity Co. of Macclesfield, Ltd.

Ceylon Hydro-electric Scheme Contracts

The placing of contracts by the Crown Agents for the Colonies for the supply of plant in connection with the Ceylon hydro-electric scheme has now been announced, states *The Times*, and it is satisfactory to note that, in spite of world-wide competition, the whole of the equipment will be ordered in Great Britain. The section comprising the pipe lines, amounting to £91,950, has been placed with Stewarts and Lloyds, Ltd., whose consulting engineers for this class of work are Hatfield, Perrin and Partners, Ltd. This decision is welcome since in recent years all important power pipe-line contracts in India, with the exception of the Malakand project, the equipment for which was also supplied by Stewarts and Lloyds, have been placed with foreign makers. The order was placed in this country on its merits, without giving British makers any substantial preference in price.

New Lamp Publications

In preparing its new decorative lighting booklet, the Metropolitan-Vickers Electrical Co., Ltd., has endeavoured to provide ideas for those who use artificial lighting for advertising, decoration and illumination. A complete range of "Cosmos" and "Metrovick" lamps and floodlights is included with novel ideas for the use of "Decora" opal tubes. These designs should appeal to architects especially, and to hotel and cinema proprietors. The company's new catalogue entitled "Calculated Control," contains full information of "Metrovick" discharge lamps and general service "Cosmos" lamps. All sections in the catalogue are easily found by means of the use of different coloured page edges. Articles are included on two new "Metrovick" systems, one of centralised control for switching street lighting, &c., and the other an A.R.P. lighting system.

New Catalogues and Lists

Consolidated Pneumatic Tool Co., Ltd., 232, Dawes Road, London, S.W.6.—An illustrated booklet dealing with "Hycycle" tools.

Ferranti, Ltd., Hollinwood, Lancs.—Details of the company's new line tester.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A booklet on industrial vacuum cleaning.

Brown Brothers, Ltd., Brown Buildings, Great Eastern Street, London, E.C.2.—Details of blended light troughs, and shop window troughs.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Phœnix vacuum cleaner.
Daily Dipper washer.
G. & B. Switchgear.
B.D.C. waterless cooker.

be sacrificed to the taking of a bulk supply, the cost of which is largely on a kilowatt basis, is commented upon in an interesting survey of the year's operations of the Guildford Electricity Department. Between the previous year's net surplus of £5,913 and the 1938-39 debit balance of £1,791 is a difference of £7,704 which is stated to be entirely attributable to two factors: cold and coal. With the exception of a short period on Tuesday, December 20th, 1938, the maximum demand did not exceed 14,655 kW, but the quite exceptional cold of that time resulted in an extra demand from consumers, on that day only, of 1,445 kW. Having no standby generating plant of its own the whole of this had to be taken from the grid at an extra cost of £4,015. Further, the extra cost of coal compared with the previous year, payable as an addition to the grid price, amounted to £1,260, and the increased cost of coal for the Department's own generating plant was £2,044.

It must be recognised, it is stated, that the domestic "all-in" rate, under which the more electricity consumed the lower is the average price, was based upon the fact that an increased number of kWh generated leads to decreased average cost price per kWh. Now that an increasing proportion of electricity is purchased from the grid at a fixed rate, the decrease of cost price per kWh with the increase of demand ceases to apply. On the other hand working costs, on items other than fuel and kilowatt charges, have been regularly reduced as output increases, and will continue to be lowered. Care and foresight in the past have provided a reserve fund which in case of need would act as a price equalisation fund, and short of unforeseen happenings no increase in prices to consumers is anticipated.

Last year the number of kWh sold increased by nearly five and a quarter millions, and of this increase nearly four and a half million kWh was sold on the "all-in" rate, under which about 60 per cent. of the consumers are supplied. Total sales amounted to 35.9 million kWh, the increase over the previous year being 17 per cent. The number of consumers rose by 1,083 to 16,392. The average price received per kWh sold was 0.956d. compared with 1.01d. in the previous year. The borough electrical engineer is Mr. W. E. Affleck.

Hull.—PURCHASE OF DOMESTIC APPARATUS.—The Electricity Committee is seeking sanction to utilise £50,000 of surplus revenue for domestic apparatus for hire.

Inverness.—REDUCTION IN CHARGES.—The fourth consecutive annual reduction in charges and the seventh in the last eight years has been authorised by the Town Council and will come into force next November. The concessions are as follows: Lighting reduced from 4½d. to 4d. per kWh; domestic tariff running charge reduced from ⅝d. to ½d.; lighting rate outside burgh boundary reduced from 5d. to 4½d. per kWh.

King's Lynn.—SUPPLY TO FACTORY.—The Town Council is to connect the West Lynn canning factory to the Marshland ring main at an estimated cost of £1,100.

Kirbymoorside.—WAYLEAVE DIFFICULTY.—It was reported to the Council last week that the scheme for supplying electricity to the moorland village of Lastingham had been held up owing to the inability of the North-Eastern Electric Supply Co. to secure one wayleave. Some houses had been wired for nearly a year waiting for the supply. The company stated that it would be necessary to revert to the original proposal to put poles in the main street of the village. A similar difficulty was being experienced at Hutton-le-Hole.

Leeds.—NEW SWITCHGEAR.—The Electricity Committee is to replace the switchgear at the Whitehall Road generating station by modern equipment.

EXTENSION.—The Health Committee has arranged for the Electricity Department to lay a cable for the supply of electricity to the sunshine houses at the Killingbeck sanatorium.

Manchester.—CONCLUSION OF INQUIRY.—When the inquiry into coal supplies for the Corporation's power stations (ELECTRICAL REVIEW August 4th, p. 174) was closed last week Prof. R. A. Eastwood, who presided over the tribunal, announced that its decision would be published at a later date. Mr. B. S. Wingate-Saul, for Lancashire Associated Collieries, claimed that the prices charged compared favourably with those to other comparable consumers in the district. He admitted that the Corporation had lost the geographical advantage of having its Barton power station in the immediate neighbourhood of the pits, but maintained that this was equitable. Mr. P. B. Dingle (Deputy Town Clerk) submitted that there was no substance in Mr. Wingate-Saul's contention that the L.A.C. was merely carrying out the instructions of the Central Council to introduce an equitable system of co-ordinated prices on "a delivered basis." In fact, he urged, the executive board had failed to fix minimum prices as required by the scheme. All that happened was that a sub-committee with no legal standing solemnly sat and fixed minimum prices which were varied at will. Mr. Dingle further contended that the return on the capital invested in the L.A.C. was too high, and urged the tribunal to take this matter into serious consideration.

Mansfield.—LOANS.—The Electricity Committee is seeking sanction to borrow £10,000 for meters and £20,000 for mains and services.

NEW SUB-STATIONS.—The Electricity Committee is to erect sub-stations at Littleworth at a cost of £2,972 and at Bould Street (£1,666).

Montrose.—TWO-PART TARIFF REDUCTION.—The North of Scotland Electric Light and Power Co., Ltd., has announced that the fixed charge of the two-part tariff will be reduced from 22s. to £1 per annum for each habitable room in domestic premises and for each 100 W of effective lighting in shops, offices, &c. The running charge will be ¾d. per kWh instead of 1d. falling to ¾d. after a certain consumption as hitherto.

Norwich.—SUPPLY FAILURE.—An error during a series of switching operations is given as the cause of the supply failure on July 28th in a statement issued by the Electricity Committee. This explains that for several weeks past extensive modifications of the main 6,600-V switchgear installed at Thorpe power station prior to 1932 had been proceeding with a view to improving its suitability and reliability for the extensive network of supplies it now has to control. In order to maintain supplies to all consumers during the alterations a large number of switching operations was necessary, as first one section and then another was made available for modifications, and it was during a series of these operations that an error was made, and a panel which had previously been made "dead" and earthed was connected to the main switchgear 6,600-V bus-bars which were being supplied at the time by generators in the Thorpe power station, totalling 50,000 kW capacity, and to which also the grid system was connected through two 30,000-kVA transformers. The resultant short-circuit with all this plant connected caused an immediate fire in one of the bus-bar isolator chambers, and a second fire on the opposite side of the passageway where the copper connections to oil-circuit-breakers are housed. This second fire spread very rapidly to three adjoining panels, and although the fires lasted only for about one minute, extensive damage was done to the four panels involved. The Thorpe power station main 6,600-V switchgear, consisting of some 36 panels, was sectionised into five fireproof compartments eighteen months ago and two separate systems of automatic fire fighting equipment were installed. Both these plants came into immediate operation and they, coupled with the fireproof compartments, undoubtedly saved what might have been a major disaster.

Nottingham.—COMPETITION CRITICISED.—Presenting the annual report of the Gas Department at last week's meeting of the Council, Sir Albert Ball referred to the "feverish" competition between the electricity and gas undertakings. He claimed that such competition was against the interests of the ratepayers, and hoped that in the near future the Council would insist upon the two committees getting together and working out some joint scheme to avoid the present "wasteful" competition.

Peterborough.—CHANGE-OVER.—The City Council has under consideration the question of changing over the remaining DC supply to AC or providing rectifying plant.

EXTENSION.—A supply of electricity is to be given to the Lawn House estate, Dogsthorpe Road, at cost of £900. Income when the estate is fully developed will be £450 per annum.

Plympton.—LOAN FOR EXTENSION.—The Rural District Council is seeking sanction to a loan of £10,708 for a supply extension to Ivybridge.

Richmond (Middlesex).—STREET LIGHTING DECISION DEFERRED.—A recommendation that the Council should accept the tender of the London and Home Counties Joint Electricity Authority for street lighting throughout the borough, which would mean the substitution of electricity for gas at Hampton, Hampton Hill and Hampton Court, was referred back at a recent meeting of the local authority. It was suggested that the matter was not urgent and should be further considered.

Risley (Derbyshire).—PROTEST AGAINST GAS LIGHTING.—A resolution protesting against the decision of Risley Parish Council to light the village by gas instead of electricity was adopted by 46 votes to 11 at a parish meeting held last week at Risley Council School.

Scunthorpe.—LARGE INCREASE IN SALES.—With a growth in sales of 4¾ million kWh (53 per cent.) against 2½ million kWh (37 per cent.) last year, electrical development in Scunthorpe continues to advance at a rapid rate. A bulk supply is now being taken from the Central Electricity Board and one of the previous suppliers—a local steelworks—is now buying in bulk from the Corporation, and as this load has only been connected for a few months, the progress made seems likely to be surpassed in future. The undertaking is in a sound financial position, having a reserve fund of over £10,000, and this year has a surplus of £9,056 against £9,521 last year, while nearly £3,500 has been contributed to the local rates in the two years. Some 950 consumers were added during the year, and in view of the fact that practically all premises in the area are connected to the supply, this increase represents new property. Most notable increases in consumption are concerned with the rateable value tariff (1 million kWh) and power (3½ million kWh), and it is interesting to note that the average price obtained shows a decrease of 0.362d. from 1.662d. last year.

Seaham Harbour.—LOANS.—The Urban District Council is applying to the Electricity Commissioners for sanction to borrow £3,966 for the laying of electricity mains on the Colliery Ward estate and application is being made to the Ministry of Health to borrow a sum of £1,220 for street lighting on the estate.

Seaton Valley (Northumberland).—SUPPLY EXTENSION.—Negotiations are proceeding between the North-Eastern Electric Supply Co., Ltd., and the Urban District Council for a supply of electricity to houses at Seghill. The company has announced that it is willing to lay the cables underground provided the Council reinstates the carriageways. The Council was recommended to accept the offer, but an amendment that the company should be pressed to place the cables underground free of charge was adopted. The cost of wiring the houses is estimated at £1,658.

Sheffield.—NEW EQUIPMENT.—It is proposed, if sanction is obtained, to devote out of the anticipated profits for the year, sums of £20,000 for meters and transformers, £2,000 for sub-station sites, £5,000 for buildings, £20,000 for sub-station transformers and £20,000 for wiring.

South Shields.—LOAN.—The Town Council is applying to the Electricity Commissioners for sanction to borrow £10,000 for mains extensions.

Stafford.—INCREASED CHARGES.—It is proposed to increase the fixed charge of the "all-in" domestic rate from 5s. to 7s. a year per 100 sq. ft. of floor area for the first 1,000 ft. and from 2s. 6d. to 3s. 6d. for the second 1,000 sq. ft. The minimum charge will be increased from £2 to £2 10s. a year. In the case of business premises the proposed charge per kW of lamps installed is £3 per quarter instead of £2.

Stoke-on-Trent.—DISTRIBUTION PROJECTS.—The Electricity Committee is to build sub-stations in Grove Road, Fenton (£2,050)and Poplar Drive, Blurton (£2,800). It is also to provide a supply to the Bradwell Hall Farm estate at a cost of £2,100, and mains are to be extended in Wolstanton at a cost of £650. The Committee has come to terms with the British Aluminium Co., Ltd., and Bullers, Ltd., for a supply to works at Milton at a cost of £4,000. Each company will contribute £1,500 towards the cost. Work is to be carried out at Normacot to improve the supply at a cost of £1,300.

St. Helens.—GENERATING STATION EXTENSION.—The Electricity Committee is seeking sanction to the borrowing of a sum of £250,000 for extending the generating station.

Sutton Coldfield.—BASIS OF FIXED CHARGE.—The present method of arriving at the fixed charge of the contract tariff for residential premises is on the rateable value basis. At its recent meeting, however, the Town Council decided that this should be discontinued and the fixed charge calculated in each instance "on the merits" of the case, the altered basis to apply to new consumers and present consumers transferring to the tariff on or after September 30th next. The view that the Council was giving the Electricity Committee a blank cheque to do just what they liked was expressed by Alderman Lawrence. Alderman Pearson said it had been found that there were about a hundred large consumers who were getting their electricity cheaper than it cost the Council. Councillor Terry asked what appeal consumers would have, to which Alderman Pearson replied that the appeal would be to the Electricity Committee and the Council.

Torquay.—PROPOSED POWER STATION EXTENSIONS.—The Electricity Committee is to discuss with the Central Electricity Board the proposals for the extension of the Newton Abbot power station by the installation of a 30,000-kW set and steam raising plant.

Walsall.—SUPPLY EXTENSION.—The Electric Supply Committee is to lay a further cable from the Aldridge sub-station to the Lichfield boundary and provide an additional outdoor transformer, at an estimated cost of £3,600, in order to meet the growing demand for electricity in Lichfield.

LOAN.—Application is to be made for sanction to borrow £12,000 for the purchase of sub-station equipment.

Walton and Weybridge.—SHOWROOMS SCHEME.—When a scheme for the erection of electricity showrooms at a cost of £25,000 was put forward at a meeting of the Council recently it was suggested that this was not the time to embark on such an expenditure. The chairman of the Electricity Committee replied that the fact that there was a deficit on the undertaking last year did not mean that it was on its "last legs"; when they reduced the charges they expected a deficit. Consumers were increasing their use of electricity, however, and he did not think there should be any doubt about the state of the undertaking's finances in the future. It was decided to invite tenders for the scheme.

West Bromwich.—AIR-RAID PRECAUTIONS.—A.R.P. works costing £2,671 have been authorised by the Electricity Committee.

Overseas

Canada.—PROSPECTIVE SHORTAGE OF POWER.—By 1942 or 1943 the Ontario Hydro-Electric Power Commission will be faced with the need for obtaining large quantities of power, Dr. Thomas H. Hogg, the chairman, stated in an interview recently. He added that they could look to only three developments for this power—the St. Lawrence, Niagara Falls, or the Ottawa River. By treaty with the United States development of Niagara was tied to development of the St. Lawrence, and development of the Ottawa River needed co-operation from Quebec. He would not predict which of the developments would be considered. Charges to municipalities would be reduced as soon as the Commission was sure that it had reached a safe financial position, he declared.

France.—IMPORTANT MERGER IN ALPS.—The merger between the Société Hydro-Electrique de Fure et Morge et de Vizelle with the Société Generale Force et Lumière, which was recently carried out, forms one of the most important in France. The new group controls 43 power stations between the Mediterranean and Lake Geneva.

Northern Ireland.—GENERATION OF ELECTRICITY.—A return issued by the Ministry of Commerce shows that 57.2 million kWh was generated by authorised undertakings in Northern Ireland during the quarter ended June 30th, as compared with 52.7 million kWh in the corresponding quarter of 1938, representing an increase of 4.5 million kWh, or 8.5 per cent. The total amount generated during the first six months of 1939 was 135.2 million kWh, as compared with 120.7 million kWh for the corresponding period of 1938, an increase of 14.5 million kWh, or 12 per cent.

TRACTION

France.—TROLLEY-BUSES ADVOCATED.—The Minister of Public Works has addressed a note to the prefects of all the French departments recommending the responsible authorities to consider the question of replacing tramways or motor-buses by trolley-buses. This method of transport, says the Minister, does not seem to have received the attention it deserves from the departments and communes when tramways have been done away with and replaced with motor-buses. Although the trolley-bus seems most often destined to take the place of tramways, it would be well, says the note, to consider, in making future changes, whether it would not often be advantageous to substitute it for motor-buses. One of the chief reasons put forward for introducing trolley-buses wherever possible is that the Government wishes to encourage the use of power produced entirely in France. Under this heading electricity takes the first place, and the use of the trolley-bus would mean a reduction in imports of liquid fuel.

Wolverhampton.—NEW TROLLEY-BUSES.—The Transport Committee is to purchase four trolley-buses at an estimated cost of £8,800.

COMMUNICATIONS

Great Britain.—PROPOSED WIRELESS STATION.—At a recent meeting of the Feltham (Middlesex) Urban District Council it was reported that the Air Ministry was considering acquiring about eight acres of land at Bedfont for a wireless station.

India.—TELEPHONE CABLE.—As it has been found that the long-distance telephone wires in India are liable to damage by wild elephants and fallen trees, an order was given some time ago for 544 km. of cable for the State of Travancore, South India. This cable has been delivered by a German concern (Siemens) and will be laid from the plantations in the Deccan mountain range, at a height of 2,000 metres, through the jungle to the seaport on the West coast.

NEW BROADCASTING STATION.—The Government of Baroda has placed a contract with the Marconi Company for a 5-kW medium-wave transmitter complete with studio equipment.

Dimming of Lights

IN the House of Commons on August 3rd Mr. Groves asked the Lord Privy Seal if, in regard to domestic electric light bulbs in case of emergency, his Department had considered, or experimented with, any process for the dimming or covering of the globe to prevent outside reflection but leave reasonably sufficient interior lighting; and, if not, in view of the fact that curtains or blinds might not be available or serviceable, would he consider the possibilities of such light cover and consult with local electricity authorities as to the provision of stocks of these covers?

Sir J. Anderson said that a number of devices for the dimming and shading of domestic electric light globes had been brought to the notice of his Department, but none of these would give sufficient internal light without external visibility, and there was no practicable alternative to the screening of windows.

B.S. Nomenclature for Welding

A REVISION of the British Standard "Nomenclature Definitions and Symbols for Welding and Cutting," first issued in 1933 under the authority of the Mechanical Industry Committee, has been published. The former scheme of symbols for indicating welds on engineering drawings based on the use of letters to show the general form of the weld with a suffix and number relating to the details has been abandoned in favour of the use of diagrammatic symbols (based upon proposals of the Institute of Welding) indicating only the more generally used forms of welds. The new scheme follows closely the lines suggested for international standardisation. Copies of B.S. 499 are obtainable from the British Standards Institution (Publications Department) at 2s. 2d. (post free).

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Autofrost, Ltd. — Private company. Registered July 31st. Capital, £1,000. Objects: To carry on the business of refrigeration and cold storage engineers, manufacturers of and dealers in machinery, apparatus and equipment, and chemicals and compositions concerned with refrigeration and cold storage, &c. A. C. Wheeler, 70, Wellington Road, Enfield, is a permanent director. Secretary: William Ross, 12, Freeland Road, W.5.

Electrical Efficiency Service, Ltd.—Private company. Registered July 28th. Capital, £1,000. Objects: To carry on the business of electrical contractors and electric wiring and installation specialists, &c. Subscribers: J. W. Cockram and Mrs. L. H. E. Cockram, both of 95, Elmwood Crescent, Luton. Secretary: W. H. French, 21, Cardiff Road, Luton.

Riley & Neate, Ltd.—Private company. Registered August 1st. Capital, £40,000. Objects: To acquire the business of electrical and civil engineers carried on by D. S. Riley and E. C. Neate at 45, Jewry Street, Winchester, Southampton, as Riley & Neate. Directors: D. S. Riley and Mrs. F. E. Riley, both of "Roughlee," 15, Westfields, Richmond, Yorks, and E. C. Neate and Mrs. V. D. Neate, both of Lesney, Clifton Road, Winchester. Registered office: 45, Jewry Street, Winchester, Hants.

Midgley Electrical Instruments, Ltd.—Private company. Registered August 2nd. Capital, £16,000. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in organs and musical instruments, sound-producing, reproducing and recording apparatus, amplifiers, loudspeakers, &c. Subscribers: F. P. Walker, 210, High Holborn, W.C.1, and A. M. Midgley, The Cottage, Cuckoo Hill, Pinner, Middlesex. Manager: A. M. Midgley. Registered office: Duke's Road, Western Avenue, W.3.

Brown & Williams, Ltd.—Private company. Registered July 31st. Capital, £2,000. Objects: To acquire the business of electrical and mechanical engineers, carried on by E. Williams and W. S. Williams at rear of 182, Union Street, Plymouth, as "Brown & Williams"; and to carry on the business of wireless, motor, mechanical and general engineers, &c. The first directors are: Mrs. E. Williams, 7, Linden Terrace, Plymouth, and four others. Solicitor: T. W. Emerson, 3, Sussex Terrace, Princess Square, Plymouth.

E. N. Kenworthy (Washers), Ltd.—Private company. Registered August 2nd. Capital, £1,000. Objects: To acquire from J. Claughton and F. Vause a licence to manufacture, sell, sub-license and exploit in the United Kingdom for use therein certain improvements relating to electric washing machinery, the subject of provisional patent dated March 28th, 1939, and numbered 9,600, and to carry on the business of manufacturers, factors, merchants and retailers of all washing appliances for domestic and general laundry purposes, &c. Directors: J. Claughton, 486, Burnley Lane, Chadderton, Lancs, F. Vause, 11, Ashes Lane, Springhead, Oldham, and H. Reed and J. Ritchie, addresses not stated. Solicitors: Boote Dutton & Whittaker, 12-16, Booth Street, Manchester.

Electrotest, Ltd.—Private company. Registered August 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical measuring, testing and scientific apparatus of all kinds, wireless and television sets, &c. The directors are: E. Kent, 261, Norwood Road, Southall, Mddx.; S. Lackington, 19, Chepstow Road, W.2; and L. Urmenyi, 4, Sunnyside, Joel Street, Eastcote, Mddx. Registered office: 2, Sunnyside, Joel Street, Eastcote, Pinner, Mddx.

Jaffé Rose & Co., Ltd.—Private company. Registered August 3rd. Capital, £5,000. Objects: To acquire the business of manufacturers, importers and exporters of table lamps, figure lamps, bronze figures, onyx ware, alabaster ware, petit point productions, glassware and porcelain ware, carried on by Wm. A. Rose at 29/30, Holborn Viaduct, E.C. W. A. Rose is permanent governing director. Solicitors: Stafford Clark & Co., 3, Laurence Pountney Hill, E.C.4.

Magic Mirror Co., Ltd.—Private company. Registered August 3rd. Capital, £17,000. Objects: To adopt an agreement with Norman & Dobbin, Ltd., and to carry on the business of advertising contractors and agents, manufacturers of and dealers in electrical and mechanical apparatus and appliances employed by advertising contractors, &c. Permanent directors: R. Jeffcoat, 5, Berkeley Square, Clifton, Bristol; H. W. Norman, "Talbothayes," Shirehampton Road, Stoke Bishop, Bristol; and M. B. Dobbin, 12, Eaton Crescent, Clifton, Bristol. Registered office: 70, Park Street, Bristol.

Companies' Returns

Statements of Capital

Babcock & Wilcox, Ltd.—Capital, £4,620,000 in 100,000 6 per cent. preference, 200,000 5 per cent. second preference and 4,320,000 ordinary shares, all of £1. Return dated May 25th. 100,000 preference, 179,056 second preference and 4,299,656 ordinary shares taken up. £1,029,884 paid on 179,056 second preference and 850,828 ordinary shares. £3,548,828 considered as paid on 100,000 preference and 3,448,828 ordinary shares. Mortgages and charges, nil.

Shoreham and District Electric Lighting and Power Co., Ltd.—Capital, £200,000 in £1 shares. Return dated May 27th. 140,000 shares taken up. £133,500 paid. £6,500 considered as paid. Mortgages and charges, nil.

Cawnpore Electric Supply Corporation, Ltd.—Capital, £547,986 in 200,000 preference and 347,986 ordinary shares of £1. Return dated May 29th. 200,000 preference and 200,000 ordinary shares taken up. £325,000 paid on 200,000 preference and 125,000 ordinary shares. £75,000 considered as paid on 75,000 ordinary shares. Mortgages and charges, £300,000.

Richmond (Surrey) Electric Light & Power Co., Ltd.—Capital, £400,000 in £1 shares. Return dated April 11th. 310,000 shares taken up. £200,000 paid. £110,000 considered as paid. Mortgages and charges, nil.

Geo. Bray & Co., Ltd.—Capital, £160,000 in 80,000 preference and 80,000 ordinary shares of £1. Return dated May 19th. 55,000 preference and 55,000 ordinary shares taken up. £7 paid. £109,993 considered as paid. Mortgages and charges, £40,000.

W. E. Dove & Co., Ltd.—Capital, £3,500 in 350 shares of £10. Return dated April 13th. 320 shares taken up. £2,000 paid. £1,200 considered as paid. Mortgages and charges, £3,800.

"J.D." Insulating Co., Ltd.—Capital, £20,000 in £1 shares. Return dated March 3rd. 4,200 shares taken up. £4,200 paid. Mortgages and charges, £3,000.

Mawdsley's, Ltd.—Capital, £50,000 in 25,000 preference and 25,000 ordinary shares of £1. Return dated March 24th. All shares taken up. £44,000 paid. £6,000 considered as paid. Mortgages and charges, nil.

Direct West India Cable Co., Ltd.—Capital, £200,000 in £1 shares. Return dated May 22nd. All shares taken up. £200,000 paid. Mortgages and charges, nil.

Merthyr Electric Traction & Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5. Return dated May 26th. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges, £43,835 12s.

Monmouth Electricity Co., Ltd.—Capital, £50,000 in £1 shares. Return dated May 29th. 35,000 shares taken up. £35,000 paid. Mortgages and charges, nil.

Western Electric Co., Ltd.—Capital, £20,000 in £1 shares. Return dated June 5th. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Mortgages and Charges

Aerialite, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated July 3rd, 1939, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Satisfaction on July 5th, 1939, of debenture dated April 13, 1937, and registered April 21st, 1937.

North-Eastern Electric Supply Co., Ltd.—Satisfaction to the further extent of £16,672 on July 1st, 1939, of trust deed dated October 31st, 1930, and registered November 8th, 1930, securing £2,300,000 5 per cent. consolidated debenture stock.

Pisagua Holdings, Ltd.—Land Registry Charge on 7, Ravensbourne Park, Catford, S.E., dated July 24th, 1939, to secure £1,000. Holders: Sir Henry D. Kimber, Bt., Hitcham Place, Burnham, Bucks; and Lt.-Col. H. Llewellyn, Devizes, Wilts.

Receiver Appointed

Tyche, Ltd.—M. B. Browne, of 1/4, Broad Street Place, E.C., was appointed receiver and manager on July 27th, 1939, under powers contained in debenture dated October 3rd, 1932.

Winding-up Petition

Architectural Constructional & Electrical Utilities, Ltd.—A petition for the winding-up of this company was presented to the High Court on July 27th by Biram & Co., Ltd., and will be heard in London on October 9th. Any person who intends to appear on the hearing of the petition must serve on Mr. J. C. Brookhouse, 8, Queen Street, London, E.C.4, solicitor for the petitioners, notice of his intention to do so by October 7th.

Company Liquidations

Universal Radio Distributors, Ltd., Fitzroy Square, London, W.—A meeting of the creditors was held on August 3rd at the Holborn Restaurant, London, W.C. Mr. G. Mayle, one of the directors, occupied the chair, and it was reported that the company had gone into voluntary liquidation, and that Mr. L. V. Smith, the receiver for the debenture holder, had been nominated as liquidator. An approximate statement of affairs as at December 20th last was submitted which showed ranking liabilities of £16,925. The net assets were £13,801, leaving a deficiency, as regarded the creditors, of £3,124. The proceedings terminated without any resolution being passed and the voluntary liquidation of the company will, therefore, be continued with Mr. Smith as liquidator.

P. J. Wilson (Leeds), Ltd., electrical contractors, Leeds.—The statutory meeting of creditors was held recently at the Hotel Metropole, King Street, Leeds, when Mr. P. J. Wilson, a director of the company, presided. The statement of affairs disclosed liabilities of £1,288 and net assets of £769, leaving a deficiency, as regarded the creditors, of £519. The deficiency was attributed to a loss on the trading and the writing down of the assets. A resolution was passed confirming the voluntary liquidation of the company with Mr. J. Wardale and Mr. F. C. Holliday as joint liquidators, with a committee.

Star Electric Works (Newcastle), Ltd.—Meetings August 25th at Royal Exchange Buildings, Hood Street, Newcastle-upon-Tyne, to receive an account of the winding-up by the liquidator, Mr. S. M. Bell.

John Lightfoot, Ltd.—Winding up

voluntarily. Liquidator, Mr. W. P. Masterson, 24-28, Bank of England Chambers, Tib Lane, Manchester.

Warners Electrical Trust, Ltd.—Particulars of claims by September 9th to Mr. H. Rainsbury, liquidator, 133-139, Finsbury Pavement, E.C.2.

Charlton Higgs (Radio), Ltd.—Winding up voluntarily. Liquidator, Mr. R. Wilson, 260, Swan Arcade, Bradford.

Ralph Garrett, Ltd. — Winding up voluntarily. Liquidator, Mr. B. J. M. Boys, 94, Church Road, Hove.

Bankruptcy Proceedings

G. F. Germaney, 26, Corringham Road, Stanford-le-Hope, Essex, radio dealer.—Application for discharge on behalf of this debtor was made recently at the Petty Sessions House, Southend-on-Sea. Debtor's counsel stated that debtor could not attend owing to illness. The receiving order had been made this year. The Official Receiver stated that the liabilities amounted to £642, and a dividend of 7s. in the £ would be paid. The failure was attributed to ill-health and insufficient profits to cover expenses. The discharge was granted subject to two months' suspension.

W. S. Scott, carrying on business as The West End Radio, 452, West Road, Newcastle-upon-Tyne, radio engineer.—The public examination of this debtor was held at the Court House, 56, Westgate Road, Newcastle-upon-Tyne, recently. The statement of affairs lodged disclosed ranking liabilities of £594 and estimated assets of £155, leaving a deficiency of £439. Debtor attributed his failure to lack of capital, depression in the radio business and losses incurred under guarantees given in respect of hire-purchase transactions. The examination was adjourned.

W. L. Hughes, electrical engineer, 15, Wickham Road, Beckenham, Kent.—First meeting August 16th at 195-203, Waterloo Road, S.E.1. Public examination September 28th at the County Court, Croydon.

S. Herzberg, electrical dealer, 11, Victoria Dock Road, Canning Town, London.—Discharge suspended for eighteen months until January 6th, 1941.

I. A. G. Young and **B. G. Wood** (National Radio Supplies), New Arcade Buildings, Market Place, Burton-on-Trent (separate application of I. A. G. Young).—Discharge granted, but suspended for six months. Date of order, June 14th.

H. M. Brown (Wood & Co.), electrical engineer, 97, St. Helens Street, Ipswich.—Last day for receiving proofs for dividend, August 21st. Trustee, Mr. J. B. Sanderson, 17, Museum Street, Ipswich.

G. A. Wood (A. G. Wood), electrical engineer, 129, Bolton Road, Darwen.—First and final dividend of 1s. 11d. in the £, payable August 21st at 7, Lord Street West, Blackburn.

L. Cole (Netherfield Radio Stores), radio and electrical engineer, 5, Victoria Road Netherfield.—First and final dividend of 5½d. in the £, payable August 17th, at 22, Regent Street, Park Row, Nottingham.

T. E. Dawes (The Green Radio & Cycle Stores), electrical and radio engineer, Market Street, Oakengates, Salop.—Public examination September 6th at the Shire Hall, Shrewsbury.

L. Jacobs (Loujay Radio), radio dealer, 162, High Street, Peckham, London, S.E.15.—Trustee, Mr. N. W. Osborne, 11-12, Finsbury Square, E.C.2, appointed July 27th.

Reports and Dividends

James Howden & Co., Ltd., held their annual meeting on August 2nd, when Mr. C. W. Hume (chairman), who presided, said that the air heaters now manufactured by the company were capable of heat recovery of over 80 per cent. and were installed on boilers with working pressures as high as 1,200 lb. per sq. in. and evaporating as much as half-a-million lb. per hour. Improvements had also been made in the fans manufactured by the company for supplying air for combustion and also for drawing the gases through the boiler. Those fans ranged from small ventilating fans to units requiring 1,500 HP to drive and weighing up to thirty-five tons.

In addition, the removal of dust and grit from the flue gases provided a wide scope for the company's products. Such installations were made in power stations and industrial plants. Some years ago Imperial Chemical Industries, Ltd., collaborated with them in the development of the Howden-I.C.I. gas washer for freeing gases from sulphurous compounds. Gas washers of that type were first installed at the Fulham power station about three years ago, and owing to their success a contract had been received for further gas washing plant at Fulham. The repeat order, with the orders for fans and air preheaters also received for the same extensions of that power station, would constitute an important part of the company's work during the coming months.

General business both in the marine and power station markets of the company was good; the volume of orders on hand at the moment constituted a record in the history of the company, and indications at the present time were excellent.

A. C. Cossor, Ltd.—Steps are being taken for A. C. Cossor (Holdings), a subsidiary of Sterling Industries (formerly Ismay Industries), to dispose of its holding of 1,000,000 5s. ordinary shares of A. C. Cossor, Ltd. Sterling Industries has arranged, with the concurrence of the directors of A. C. Cossor, Ltd., provisional terms for the disposal of the shares.

Before the transfer is completed, it will be necessary to modify an agreement of February, 1938, whereby A. C. Cossor (Holdings), the vendors, agreed not to sell or deal with the 1,000,000 shares for three years. Ismay Industries were given the right for a similar period to appoint two directors of A. C. Cossor, Ltd.

A meeting of shareholders of A. C. Cossor, Ltd., was to be held yesterday (Thursday) to approve a provisional agreement for the release of the restrictions attached to the transfer of the shares, and the release by Sterling Industries of its right to appoint two directors of A. C. Cossor. The agreement is conditional on its approval by the holders of the shares being transferred and on changes being made in the directorate of A. C. Cossor.

The directors report that the turnover of the company for the first three months of the current financial year is greater than for any similar period in the history of the business.

Rawlings Bros. report a net profit for the year ended March 31st of £8,099 (against £12,533 in the preceding year). The ordinary dividend for the year is 7½ per cent. (same and bonus of 2½ per cent.), directors' fees require £1,000, employees' benevolent and retirement account £500, and £5,464 is carried forward (against £4,783 brought in).

George Kent, Ltd., report a trading profit for the year ended March 31st, including dividends and sundry revenue of £55,137, as compared with £56,166 in the preceding year, and after meeting depreciation, directors' fees, N.D.C., &c., there is a balance of £33,607 (against £31,523). The final ordinary dividend is 7 per cent., making 10 per cent. for the year (same), plus a bonus of 2½ per cent. (against 3½ per cent.), and after placing £1,500 to trustees of employees' assurance scheme, £2,500 to directorial and staff participation fund, £5,000 to dividend equalisation reserve, and £5,000 to special reserve, £41,391 is carried forward (against £43,093 brought in).

The Electrolux Corporation (of America) has declared a quarterly dividend of 30 cents per share. The corresponding payment a year ago was 40 cents per share. With previous payments of 40 cents in March and 30 cents in June the total to date for the current year is $1 per share, as against $1.2 for the same period of 1938, which was brought up to $1.6 by a final payment of 40 cents in December.

Gabriel Wade & English, Ltd., are paying a dividend of 6 per cent., plus a bonus of 4 per cent., both less tax, for the year to May 31st. For the preceding year the dividend was at the same rate, but the bonus was 2 per cent.

The Lancashire Electric Light & Power Co. is maintaining its interim dividend at 2½ per cent.

Argentine Electrical Imports

FOLLOWING a 20 per cent. increase between 1936 and 1937, Argentine electrical imports declined in 1938. The figures tabulated below, extracted from the recently issued foreign trade returns of the Republic, give the total values of the different groups, with notes of increase or decrease compared with 1937. It will be noticed that the increase in the wires and cable section was more than offset by declines in imports of batteries, radio sets, meters and various other items.

In connection with the import trade in telephone material it may be remarked that in Buenos Aires 94 per cent. of the apparatus working is now on the automatic system.

The prospect that Great Britain will retain her share of the electrical import trade remains good as no alteration in the Anglo-American Trade Agreement seems to be contemplated. With regard to the arrangement made for raising the import quota for American motor-cars, it is not expected that the procedure will be extended to cover any other United States' manufactures. The values stated below are those adopted by the Argentine Customs (about 17 paper pesos to the £).

	1938. Pesos (000)	Inc. or dec. on 1937 Pesos (000)
Dynamos and motors over ¼ h.p.	3,380	+ 190
Motors under ¼ h.p.	303	— 27
Fan motors	300	— 57
Cable and wire, up to 5 mm., covered with cotton, rubber, etc.	2,165	+ 611
Cable and wire, over 5 mm., covered with cotton rubber, etc.	616	+ 68
Cable and wire, up to 5 mm., lead-covered	407	+ 123
Cable and wire, over 5 mm., lead-covered	2,423	— 604
Cable and wire, silk-covered	43	+ 9
Cable and wire, enamelled	376	— 29
Other elec. wire and cable	71	— 7
Flex, covered with cotton, wool, etc.	1,201	+ 717
Flex, covered with silk	40	— 2
Telephone cables, underground, lead-covered and steel or iron armoured	8,427	+ 1,477
Telephone cables, iron or steel, covered with cotton, gutta-percha, etc.	384	— 186
Accessories for underground cables	137	— 28
Complete accumulators for motor cars	148	— 8
Other accumulators	36	— 51
Batteries	1,264	— 534
Battery and accumulator parts	1,336	— 427
Ammeters and voltmeters	163	— 16
Radio-telephone apparatus	927	— 82
Receiving sets	3,168	— 1,170
Amplifiers	165	+ 32
Loudspeakers, metal	729	+ 14
Radio-telephone parts	3,182	— 232
Telephones	753	— 173
Telephone material	928	+ 94
Telegraph material	60	+ 15
Cookers, toasters, heaters, etc.	207	— 4
Switches, circuit-breakers, cut-outs, fuses, etc.	1,492	— 26
Vacuum cleaners	269	+ 41
Electric bells	170	— 20
Insulating tape	175	— 93
Change-over switches	1,336	+ 539
Telephone switchboards	33	+ 2
Electric furnaces	125	+ 26
Incandescent lamps	1,779	— 144
House-service meters	1,400	— 1,822
Distribution boards	254	+ 44
Insulating tubes	1,180	— 376
Insulators, porcelain	274	+ 34
Insulators, glass	32	+ 6
Other electrical materials	3,177	+ 19

STOCKS AND SHARES

TUESDAY EVENING.

IT is at this season of the year, when Stock Exchange business is almost always quiet and market prices show comparatively little fluctuation from week to week, that advantage is taken of the opportunity for drawing comparisons between current quotations and those which obtained at the beginning of the year. So many things have happened during the past seven months that it can hardly be supposed they would have failed to leave their marks upon investment values, but time slips by so quickly and memories are generally so short, that only black and white illustrations will give the investor an idea of the way in which prices have moved.

Bearing this in mind we embark, as usual at this time of year, upon a few tables of comparison, dividing these into groups whose price fluctuations afford some index to the manner in which capital has acted throughout months of stress and uncertainty.

Electricity Supply

Taking first the ordinary shares of well-known supply undertakings that operate in the provinces and Scotland, the principal feature, it will be noticed, is the rises outnumber the falls. Some of the representative examples are :—

Ordinary Shares	Dec. 30th, 1938	Aug. 8th, 1939	Rise or Fall
Bournemouth and Poole	67/6	63/9	−3/9
Clyde Valley	36/3	37/6	+1/3
Elec. Dis. Yorkshire	41/3	38/9	−2/6
Lancs. Light and Power	30/9	31/3	+−/6
Midland Counties	35/−	37/6	+2/6
Midland Elec. Power	40/−	39/6	−−/6
North Eastern	30/−	31/−	+1/−
Northampton...	46/3	47/6	+1/3
Scottish Power	35/−	36/3	+1/3
Yorkshire Elec.	38/6	37/6	−1/−

No better tribute to the confidence of investment in the shares of the electricity supply industry can be needed than the above table. Even the depreciation is of such negligible proportions as to make it abundantly clear that proprietors of these—and similar—shares are completely satisfied with the stability of their securities. More than ever before, the claim constantly advanced here that the shares are gilt-edged amongst industrial investments, is proved to be justified.

Taxation Talk

The mystifying hint of the Chancellor of the Exchequer in regard to the utility companies being specially noted for taxation purposes has aroused attention, but no apprehension as to its being likely to effect profits. There is, indeed, a readiness to dismiss the suggestion as being of theoretical rather than practical interest. If legislation is to be introduced, let Parliament propound a comprehensive plan that will remove the uncertainties which prevail in connection with what will happen at the expiry of agreements, &c. This matter, and various other points of consequence, are considered by those who are interested in the industry to be of more importance than the imposition of further restrictions upon enterprise and development work.

Manufacturing and Equipment

One of the trends of investment that stands out prominently during the present year is the disposition to exchange from fixed-interest stocks into what are called "equities." National expenditure on a colossal scale has induced a conviction that gilt-edged prices must inevitably decline. On the other hand, as employment and trade have increased by reason, largely, of the rearmament programme, the earnings of many industrial branches have expanded. They are expected to increase still further. The twin-taxes, N.D.C. and A.P.D., take a good deal of the additional earnings; costs, too, show a marked tendency to increase. For all that, however, British industrials have come into greater demand.

Erratic Price Changes

The Government has intimated that national interest is served by capital remaining in this country and not seeking American channels of investment. In various ways, therefore, public purchase of British industrials has been encouraged. The course of share prices as a whole has moved upwards. Here are a few instances, taken at random :—

Ordinary Shares	Dec. 30th, 1938	Aug. 8th, 1939	Rise or Fall
Assoc. Electrical Ind.	39/−	41/−	+2/-
Babcock and Wilcox	35/9	47/−	+11/3
British Aluminium	54/6	58/3	+3/9
British Insulated	4½	4 3/16	+ 1/16
Callender's	3⅜	3 5/16	− 1/16
English Electric	33/−	36/−	+3/−
G.E.C....	76/6	74/6	−2/−
Johnson and Phillips	36/3	40/−	+ 3/16
Siemens	21/3	23/9	+½

The fall in Callenders followed upon an unexpected reduction in the distribution. Several companies identified with radio work and television manufacture have produced disappointing results. Electric and Musical Industries, for instance, cut its dividend from 10 per cent. to 5 per cent. E. K. Cole paid nothing at all for its last-completed year.

Communication Stocks

People who bought Cable & Wireless stocks at the beginning of the year are now able to congratulate themselves upon their courage and their foresight. The last-published accounts were so much better than had been expected that the prices of the stocks abruptly spurted. There has been some reaction from the best, but substantial gains remain on balance, as this table shows :—

Stock or Share	Dec. 30th, 1938	Aug. 8th, 1939	Rise or Fall
American Tel. and Tel.	158½	179½	+21
Anglo-American Pref.	100½	93	−7½
Cable and Wireless Pref.	77½	88½	+11
Cable and Wireless Ord.	35½	51½	+16
Great Northern	37	29	−8
International Tel. and Tel.	10	7½	−2½
Marconi Marine	23/9	27/6	+ 3/16

For the heavy fall in Great Northern Telegraphs, the international situation was largely responsible. A German-Danish scare led to Continental selling. Canadian Marconi shares, after being a very quiet market, attracted notice when their Majesties the King and Queen visited America.

Miscellaneous Movements

Shares in the company that includes most of the London electricity supply concerns—London Associated Electric—started the year at 29s. 6d. and are now 25s. A rise in home railway stocks, due to improvement in the traffics, was checked by demands for increased wages. Southern preferred was 57½ last January, advanced to 75½, and is now 63. Thomas Tilling shares at 48s. 9d. have gained 5s. 6d. during the period. On the other hand, London Passenger Transport "C," at 71½ shows a decline of 2½. British Electric Traction deferred at 875 is down what, for this stock, is the trifling amount of 25. The gilt-edged securities, Central Electricity, West Midlands, London and Home Counties, have receded slightly. Amongst foreigners, Rio Fives, at 67, are 17 points to the good. In the colonial group, the recent rise in Victoria Falls ordinary to 71s. 3d. has left the shares 2s. 6d. higher.

Television

The present year was to have been one in which television, according to the estimates of everyone interested, should make great strides. Much has been done, it is true, to popularise the service, but the progress is still disappointingly slow. For this, the reasons are fairly well known, and although the problems are being solved by degrees, a good deal has yet to be done before the television set finds a place in every household. The "Emmi" company remains in official possession of the television field. The 10s. shares stand at their par price. Baird preferred and deferred are half-crown shares, the former quoted at 10½d., the latter at 1s. 1½d. Close association with Gaumonts gives Baird shares a speculative value that appeals to the buyer prepared to "take a chance." Amongst companies engaged in the manufacture of television sets, some of the most well known are E. K. Cole, General Electric, Cossor and Pye. There are, of course, a number of others. A touch of humour in this connection is provided by complaints from certain users that their television sets have suffered interference from the balloon barrage that encircles London.

American Conditions

So far as observers on this side of the Atlantic can see, American business is governed quite as much by political considerations as by those which affect actual trading and commerce. The United States politicians have no compunction in using industrial conditions in their country as a lever for influencing public feeling in their own favour and against their opponents. This seems to be the principal reason why prices of American stocks and shares fail to exhibit that resilience and strength which might naturally be expected in in view of the industrial activity in the States.

By all accounts, business in most departments of American trade is active and profitable. Share prices go ahead on balance, but the rise is subject to constant checks that are the outcome of purely political moves by one party or another. There are numbers of people in this country who hold interests in American utility and other stocks and shares. They feel perplexed and bemused by an outlook which appears to promise so favourably. Yet any rise that takes place is promptly followed by reaction. This applies all round. American Telephone and Telegraph stock is 2 points higher on the week at 179½, standing now at practically the highest price reached this year. But most of the other Americans are well below their 1939 peak.

The Week's News

Most of the electricity supply companies have now declared their interim dividends in respect of the current twelve months. These are practically the same as usual, and the price-list of this group exhibits no real change. Victoria Falls have come back ¼, to 71s. 3d., after their somewhat breathless advance. The home railway group is disturbed by the labour demands already mentioned. Southern preference has fallen 3 to 90½, the preferred being 2 lower at 63. Thomas Tillings maintain their higher ground : a bout of profit-taking had no further effect than to reduce the price by 9d., to 48s. 9d. Amongst the engineering shares, Tube Investments put on ½, which brought the price to 4½. British Insulated are a good market at 4 3/16. Rubber shares have began to revive. Business in the Stock Exchange markets, as a whole, is very quiet. National service obligations combine with the holiday season to develop something approaching a black-out in the matter of public orders.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Aug. 8	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole ...	68/3	63/9	15	15	63/9	—	4 14 4
British Power and Light ...	30/9	26/–	7	7	28/6	—	4 18 3
City of London	33/9	31/–	7½	7½	31/–	—	4 16 9
Clyde Valley	37/9	34/–	8	8	37/6	—	4 5 4
County of London ...	46/9	41/9	10½	10½	43/6	—	4 16 8
Edmundson's :							
7% Pref....	31/6	30/–	7	7	30/–	—	4 13 4
Ord.	27/9	23/–	9	6	25/6	–3d.	4 13 2
Elec. Dis. Yorkshire ...	41/6	37/9	9	9	38/9	—	4 12 9
Elec. Fin. and Securities ...	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation...	51/9	47/6	12	12	47/6	—	5 1 1
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power ...	34/6	29/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric ...	29/3	25/–	7	7	25/–	—	5 12 0
London Electric	34/3	32/–	7	7	32/6	—	4 6 2
London Power Deb. Red....	106½	102½	5	5	104	—	4 16 2
Metropolitan	51/–	45/3	12	12	46/3	—	5 4 0
Midland Counties	38/9	34/–	8	8	37/6	+6d.	4 5 4
Mid. Elec. Power	41/9	38/3	8	9	39/6	—	4 11 2
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric :							
Ordinary...	32/3	28/6	7	7	30/6	—	4 11 10
7% Pref....	32/6	30/–	7	7	31/–	–6d.	4 10 4
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13¾	12¾	6	6	12¾	—	4 14 1
Northmet Power :							
Ordinary...	46/6	41/6	10	10	43/3	—	4 12 6
6% Pref....	29/–	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/–	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	36/3	—	4 8 2
Southern Areas	22/9	19/6	5	5	20/–	—	5 0 0
South London	30/9	28/–	7	7	26/6	—	5 5 8
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/–	2	2½	18/6	—	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	37/6	—	4 5 4
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/6	—	—
Calcutta Elec.	39/–	29/–	10*	10*	30/–	—	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power ...	26/3	22/6	7	7	22/6	—	6 4 5
Jerusalem Elec.	24/6	23/–	7	7	23/–	—	6 1 9
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	22/6	8*	8*	22/6	—	—
Montreal Power	35½	31	1½	1½	35	—	—
Palestine Elec. "A" ...	29/6	21/3	7½*	5*	21/3	—	4 14 2
Perak Hydro-electric ...	18/9	15/–	7	6	15/9	—	7 12 4
Shawinigan Power ...	23½	20	85cts.	83cts.	20¾	–¼	—
Tokyo Elec. 6%	61	41	6	6	41½	–3	14 9 2
Victoria Falls Power ...	73/9	60/–	12½	15	71/3	–½	4 4 4
Whitehall Investments Pref.	19/6	16/–	7½	7½	18/–	—	8 6 8
Public Boards							
Central Electricity :							
1950–70	112	106	5	5	110xd	+2	4 11 0
1955–75	115½	108	5	5	111½	—	4 19 6
1951–73	106½	103½	4½	4½	104½	—	4 6 2
1963–93	95½	86	3½	3½	90½	–1	3 17 6
London Elec. Trans. Gtd.	88½	84	2½	2½	85½	—	2 18 6
London & Home Counties							
1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport :							
A	114½	104½	4½	4½	106½	–1	4 4 6
B	117½	105	5	5	105½	–1	4 14 9
C	83½	64½	4½	4	71½	–1	5 12 0
West Midland Joint Elec.,							
1948–68	112½	108½	5	5	108½	—	4 12 2
Telegraph and Telephone							
American Tel. & Tel. ...	180	159	9		179½	+2	5 0 7
Anglo-Am. Tel. :							
Pref.	101½	89½	6	6	93	–1	6 9 0
Def.	23⅜	19	1½	1½	22	–½	6 16 4
Anglo-Portuguese	24/–	19/9	8	8	20/9	—	7 14 2
Cable & Wireless :							
5½% Pref.	95½	75	4½	5½	88½	–1	6 4 4
Ord.	55	34	4	4	51½	–1	7 15 5
Income	100	95½	—	—	97½	—	4 2 1
Canadian Marconi $1 ...	5/6	3/9	—	Nil	5/–	–6d.	—
Globe Tel. & Tel. :							
Ord.	31/3	23/6	7½*	7½*	30/–	—	5 0 0
Pref.	26/9	23/3	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	38	27½	20	20	29	—	6 18 0
Inter. Tel. & Tel.	10½	7	Nil	Nil	7½		—
Marconi-Marine	30/–	23/–	7½	10	27/6	—	7 5 6
Oriental Telephone Ord. ...	2½	46/3	12*	12*	2 7/8	—	4 16 0
Radio Corpn.	8⅞	6	8	6	6½	–½	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–) ...	10/–	8/6	10	10	9/3	—	5 8 1
Western Union	28	19½	2¾	—	27½	—	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	6/3	—	—
4% Inc.	16	7	Nil	Nil	10	—	—
British Electric Traction :							
Def. Ord.	1025	700	5	5	875	—	—
Pref. Ord.	164	155	8	8	155	—	5 3 3
Bristol Trams	52/6	37/3	8	10	52/6	+6d.	3 16 4
Brazil Traction	13	7⅞	$1	50c.	8½	–½	—
Calcutta Trams	25/6	22/–	8	8	23/6	—	6 16 2
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	37/9	32/6	10	10	37/6	—	5 6 8
Mexican Light :							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	67	—	7 9 3
Southern Rly :							
5% Prefd.	75½	48	5	5	63	–2	7 18 10
5% Pref....	99½	80	5	5	90½	–3	5 10 6
T. Tilling	2½	39/6	10	10	48/9	—	4 2 0
Tilling & B.A.	54/6	50/–	10	9*	53/9	–9d.	3 7 0
West Riding	37/9	31/3	10	10	36/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord. ...	32/3	28/9	15	15	31/3	—	10 8 8
Assoc. Elec. :							
Ord.	45/3	34/9	10	10	41/–	—	4 17 7
Pref.	36/6	34/–	8	8	35/–	—	4 11 5
Automatic Telephone & El.	47/6	39/3	10	12½	47/6	—	5 5 3
Babcock & Wilcox ...	48/–	37/–	10	12½	47/–	–6d.	5 6 5
British Aluminium Ord. ...	58/9	48/9	12½	12½	58/3	–6d.	4 6 0
British Insulated Ord. ...	88/–	77/–	20	20	83/9	+⅛	4 15 10
British Thermostat (5/–)...	16/–	12/–	18½	18½	13/9	–9d.	6 14 7
British Vacuum Cleaner (5/–)	22/6	14/–	40	40	15/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/–	—	—
Callender's	92/–	60/–	20	15	66/3	–⅛	4 10 8
Chloride Elec. Storage ...	82/3	62/6	20	15	3⅛	—	4 10 4
Consolidated Signal ...	96/–	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	22/6	—	7 15 4
Crompton Parkinson :							
Ord. (5/–)	21/–	14/9	12½	15	19/6	—	—
E. K. Cole (5/–)	9/–	4/–	10	Nil	5/9	—	—
Elec. & Musical Industries							
(10/–)	14/9	8/9	10	5	10/–	–9d.	5 0 0
Electric Construction ...	38/6	30/6	12½	13½	35/–	—	7 14 3
Enfield Cable Ord. ...	58/6	2½	25	16½	51/3	—	6 7 0
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/6	30/3	10	10	36/–	–3d.	5 11 1
Ensign Lamps (5/–) ...	16/–	13/9	—	25	15/9	—	7 18 8
Ericsson Tel. (5/–) ...	43/–	35/–	25*	25*	42/6	—	2 18 10
Ever Ready (5/–)	24/–	18/6	35	30	19/–	–6d.	7 18 0
Falk Stadelmann	27/–	18/9	10	6	20/–	—	6 0 0
Ferranti Pref.	25/6	22/6	7	7	23/–	—	6 1 9
G.E.C. :							
Pref.	31/9	29/3	6½	6½	31/3	—	4 3 2
Ord.	82/–	70/9	17½	20	74/6	—	5 7 1
Greenwood & Batley ...	27/6	24/6	7	15	26/3	—	11 9 0
Hall Telephone (10/–) ...	22/3	19/3	15	15	20/–	—	7 10 0
Henley's (5/–)	21/–	17/9	20	20	19/6	—	5 2 8
4½% Pref.	23/–	21/–	4½	4½	21/3	—	4 4 8
Hopkinsons	46/3	37/3	12½	15	45/–	—	6 13 4
India-Rubber Pref. ...	21/3	20/–	5½	5½	20/–	—	5 10 0
Intl. Combustion	120/–	97/–	32½	32½	5 1/8	—	5 12 1
J. Lucas	60/–	52/–	15	15	60/–	—	5 0 0
Johnson & Phillips ...	41/3	32/–	12½	12½	40/–	—	6 5 0
Lancashire Dynamo ...	68/–	57/6	25	25	62/6	—	7 18 8
Laurence Scott (5/–) ...	12/–	10/–	15	15	10/3	–3d.	7 6 4
London Elec. Wire ...	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	42/6	13½	13½	43/9	–9d.	6 3 3
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	80/–	—	5 0 0
Pye Deferred (5/–) ...	13/9	7/6	25	25	8/9	—	14 5 8
Revo (10/–)	35/6	29/–	17½	17½	28/–	–6d.	6 5 0
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	23/9	—	6 6 4
Strand Elec. (5/–) ...	5/6	4/3	5	10	4/3	—	12 2 6
S. Smith (1/–)	9/9	6/–	37½	50	8/9	+⅛	5 14 4
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/–	—	8 6 8
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction ...	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–) ...	10/–	8/–	9	9	9/3	—	4 17 3
Tube Investments... ...	91/–	82/9	23¾	23¾	90/–	+½	5 7 7
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	18/3	10	10	18/3	–6d.	5 9 8
Westinghouse Brake ...	54/9	43/9	17½	17½	50/–	–⅛	7 0 0
Walsall Conduits (4/–) ...	31/9	24/–	55	55	25/9	–6d.	8 10 8
West, Allen (5/–)	7/6	5/9	7½	10	6/6	—	7 13 10

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

1937

22092. "Ignition circuit." H. B. Holthouse. October 11th, 1937. (509217.)

24293. "Road traffic signalling systems." Siemens & General Electric Railway Signal Co., Ltd., and F. G. Tyack. October 6th, 1937. (509395.)

26941. "Electric transmission and/or control systems." Sperry Gyroscope Co., Inc. October 7th, 1936. (Addition to 500468.) (509139.)

27130. "Electrical frequency-selective systems." J. Robinson. October 6th, 1937. (509040.)

27230. "Electrical communication systems." Telephone Manufacturing Co., Ltd., L. H. Paddle & J. G. Flint. October 7th, 1937. (Cognate application 19131/38.) (509140.)

27359. "DC dynamo-electric machines controlling the supply to electric motors and other variable loads." English Electric Co., Ltd., E. A. Binney, H. S. Pound-Corner and H. B. Sedgfield. October 8th, 1937. (509041.)

27440. "Electric-discharge devices giving visual indication of voltage." Telefunken Ges für Drahtlose Telegraphie. October 8th, 1936. (509237.)

27687. "DC electric motor control systems." English Electric Co., Ltd., H. S. Pound-Corner and H. B. Sedgfield. October 12th, 1937. (509239.)

27771. "Audio-frequency thermionic amplifiers." G. De Monge. October 13th, 1937. (509296.)

30645. "Sound-recording apparatus associated with telephone systems." Allgemeine Elektricitäts-Ges. November 7th, 1936. (509046.)

30911. "Electrical frequency-selective circuits." J. Robinson. November 10th, 1937. (509141.)

30977. "Electro-magnetic switches for flashing contacts." J. D. Donze. November 13th, 1936. (509297.)

34258. "Electrical reactors." General Electric Co., Ltd., and R. Rudenberg. December 10th, 1937. (509050.)

34309. "Electrical remote-control and indicator systems." Marconi's Wireless Telegraph Co., Ltd., N. H. Clough and E. C. Oliver. December 10th, 1937. (Cognate application 34310/37.) (509146.)

1938

802. "Electrical connecting devices." A. L. Disney and Belling & Lee, Ltd. January 11th, 1938. (509402.)

860. "Electric power cables." Standard Telephones & Cables, Ltd., T. R. Scott and J. K. Webb. January 11th, 1938. (509405.)

955. "Electric heating and cooking apparatus." R. Mercer, O. A. Knopp and H. Nehls. January 11h, 1938. (509409.)

963. "Electric signal transmission and the like systems." C. G. Mayo. January 12th, 1938. (509309.)

1043. "Electric motor control systems." English Electric Co., Ltd., and S. E. Newman. January 12th, 1938. (509261.)

1091. "Intermittent electric flash-lamps." G. F. O. Muller Ges. January 13th, 1937. (Cognate application 1092/38.) (509466.)

1182. "Tuning-indicators for wireless receivers." Telefunken Ges für Drahtlose Telegraphie. January 13th, 1937. (509414.)

1210. "Automatic voltage control of dynamo-electric generators." Lancashire Dynamo & Crypto, Ltd., and W. Stansfield. January 13th, 1938. (509318.)

1224. "Arrangement for determining the high-frequency energy absorbed in a subject while undergoing treatment with short- or ultra-short-wave electrical oscillations." Siemens-Reiniger-Werke Akt.-Ges. February 9th, 1937. (508472.)

1271. "Supply and control systems for electric motors." English Electric Co., Ltd., and H. S. Carnegie. January 14th, 1938. (509155.)

1338. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., and J. F. Mackenzie. January 14th, 1938. (509421.)

1356. "Feedback amplifiers operating at high frequencies." Standard Telephones & Cables, Ltd., R. M. Barnard and A. H. Roche. January 14th, 1938. (Addition to 506652.) (509425.)

1357. "Radio receivers." Kolster Brandes, Ltd., and K. G. Smith. January 14h, 1938. (509426.)

1358. "Frequency selective circuits." Standard Telephones & Cables, Ltd., and R. M. Barnard. January 14th, 1938. (509427.)

1364. "Loudspeakers." H. B. Davey. January 14th, 1938. (509428.)

1380. "Electric lamp appliance." Hague & McKenzie, Ltd., and R. B. Hague. January 15th, 1938. (509477.)

1455. "Means for controlling the deflection of cathode-ray and like beams." Baird Television, Ltd., and G. R. Tingley. January 17th, 1938. (Cognate application 23912/38.) (509430.)

1505. "Manufacture of selenium-coated electrodes." Westinghouse Brake & Signal Co., Ltd. October 26th, 1937. (509432.)

1561. "Time-controlled electric switching devices." J. T. Shelvin, H. List. January 17th, 1938. (509437.)

1667. "Vapour- or gas-filled electric-discharge lamps or tubes." H. C. Vereker and W. A. Stickley. January 18th, 1938. (509052.)

2086. "Aerial systems for radio receivers." Marconi's Wireless Telegraph Co., Ltd. January 21st, 1937. (509438.)

2090. "Insulated electric conductors." British Insulated Cables, Ltd., F. J. Brislee, J. Lyon, L. Macfarlane and L. R. B. Spence. January 21st, 1938. (Cognate application 35688/38.) (509324.)

2379. "Apparatus for temporarily laying electric cables." I. T. Kempe. January 25th, 1938. (509053.)

2659. "Electric arc rectifiers." British Thomson-Houston Co., Ltd., and H. de B. Knight. January 27th, 1938. (509329.)

3584. "Electric fuses." British Thomson-Houston Co., Ltd. February 4th, 1937. (Cognate application 3585/38.) (509331.)

3706. "Electric resistance alloys, wires, tapes and the like." British Driver-Harris Co., Ltd., and W. M. Kay. February 5th, 1938. (509332.)

4013. "Electro-magnetic devices." H. J. Osborn and H. J. Osborn & Sharpe, Ltd. February 9th, 1938. (509056.)

4221. "Electric cables." Callender's Cable & Construction Co., Ltd., and G. M. Hamilton. February 10th, 1938. (Cognate application 17895/38.) (509335.)

4712. "Electric motor control systems." British Thomson-Houston Co., Ltd. February 17th, 1937. (509336.)

4922. "Insulators for use in electric overhead trolley wire systems." Westinghouse Electric & Mfg., Co. February 20th, 1937. (509165.)

5164. "Static electric condensers." W. Strauss. February 15th, 1939. (509340.)

7246. "Adjusting devices for thermostatic switches." General Electric Co., Ltd., and R. Harvey. March 8th, 1938. (509065.)

7673. "Railway signalling devices." Soc. Auxilaire d'Etudes Electrotechniques. April 21st, 1937. (509066.)

8031. "Systems of electric motor control." British Thomson-Houston Co., Ltd., J. F. Kinchin and A. Williamson. March 15th, 1938. (509067.)

8185. "Making of soldered electrical connections between wires and terminals." British Insulated Cables, Ltd., H. Higham and E. Howarth. March 16th, 1938. (509169.)

11785. "Dynamo-electric machines." E. Barlow, and Metropolitan-Vickers Electrical Co. April 19th, 1938. (509359.)

13446. "Sealing of electric conductors into quartz or like highly refractory vitreous material." General Electrical Co., Ltd., N. L. Harris and W. A. Lewis. May 5th, 1938. (509077.)

14396. "Circuit arrangement for amplifying carrier frequencies." Telefunken Ges für Drahtlose Telegraphie. May 13th, 1937. (509080.)

15105. "Antenna networks particularly for systems of guiding vehicles by radio-electric waves." Standard Telephones & Cables, Ltd. June 11th, 1937. (509186.)

17632. "Door-operated electric switch." H. Delere and F. Godel. June 14th, 1938. (509084.)

20921. "Automatic frequency control for high-frequency signal receivers." British Thomson-Houston Co., Ltd. July 14th, 1937. (509088.)

21476. "End-closure for an electric heating element of high melting-point metal having ceramic protective casing." Naamlooze Vennootschap Molybdenum Co. February 14th, 1938. (509194.)

21537. "Short-period voltage impulses." B. Ceskomoravska-Kolbendanek Akciova Spolecnost Heller & J. Ibl. July 20th, 1937. (Cognate application 21538/38.) (509089.)

22624. "Electric-discharge tubes and devices comprising such tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 3rd, 1937. (509090.)

23678. "Vapour electric-discharge devices." Westinghouse Electric & Manufacturing Co. August 26th, 1937. (509464.)

25739. "Dry rectifier systems." Suddeutsche Apparate-fabrik Ges. September 2nd, 1937. (509095.)

26946. "Electro-magnetic clutching mechanisms." J. Cotal. September 25th, 1937. (509205.)

27868. "Instruments for modulating rays, especially for light-ray telephony." C. Zeiss (a firm), September 30th, 1937. (509376.)

29113. "Vacuum electric discharge apparatus." Electricitäts Ges Sanitas. October 8th, 1937. (Cognate applications 29114/38, 29115/38 and 29116/38.) (509102.)

30974. "Frequency-changing circuits employing electron-discharge tubes." Mullard Radio Valve Co., Ltd., and C. C. Eaglesfield. October 26th, 1938. (509379.)

34259. "Tuned high-frequency circuit arrangements." F. J. Chart. November 24th, 1937. (509118.)

35022. "Tiles or bricks for covering and protecting electric cables." T. A. Whitehouse, and Marston Valley Brick Co., Ltd. December 1st, 1938. (509120.)

35027. "Resilient mountings for motors." British Thomson-Houston Co., Ltd. December 1st, 1937. (509121.)

35250. "Hand - guided electrically driven machine tools." R. Bosch Ges. December 22nd, 1937. (509384.)

35286. "Arc lamp cathodes." Soc. Le Carbone-Lorraine. December 22nd, 1937. (Cognate application 35287/38.) (509291.)

1939

1186. "Magnetic control device for electrical resistance welding machines." Pressed Steel Co., Ltd., E. A. Whitaker and C. E. Slade. January 13th, 1939. (509230.)

1318. "Electric fuses." British Thomson-Houson Co., Ltd. January 14th, 1938. (509130.)

2190. "Electrical heating and cooking of solid foodstuffs, such as sausages." B. Salinski. January 21st, 1939. (509293.)

5472. "Gas-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. February 18th, 1938. (509388.)

6861. "Electric arc-welding apparatus." British Thomson-Houston Co., Ltd. March 2nd, 1938. (Addition to 472036.) (509232.)

7331. "Circuit arrangement comprising a cathode-ray tube having an intensity-controlled electrode." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 8th, 1938. (509234.)

9053. "Means for controlling the deflection of cathode-ray and like beams." Baird Television, Ltd., and G. R. Tingley. January 17th, 1938. (Divided out of 509430. (509478.)

10300. "DC dynamo-electric machines controlling the supply to electric motors." English Electric Co., Ltd., E. A. Binney, H. S. Pound-Corner and H. B. Sedgfield. October 8th, 1937. (Divided out of 509041.) (509138.)

12014. "Electrical frequency-selective systems." J. Robinson. October 6th, 1937. (Divided out of 509040.) (509235.)

15658. "Apparatus for converting direct current into alternating current." Technical Inventions, Ltd., and R. J. Elsome-Jones. May 21st, 1938. (Divided out of 508370.) (509236.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdeen.—August 15th. County Council. Electrical work at fifty houses at Boddam. Schedules from Messrs. Tawse & Allan, 10, Bon-Accord Square; tenders to County Clerk.

Adwick-le-Street.—August 16th. Electricity Department. Mercury discharge lighting equipment, Great North Road. (August 4th.)

Ardrossan (AYRSHIRE).—August 21st. Town Council. Electric lighting work at Parkhouse and Whitlees housing estate (128 houses). Joint Town Clerks, Burgh Chambers (deposit £1 1s.).

Australia.—MELBOURNE.—August 15th. Posts and Telegraphs Department. Lead-covered, unarmoured trunk type cable. (T. 24602/39.)*

September 12th. State Electricity Commission of Victoria. Two 35,000-kVA three-phase, outdoor-type transformers. (T. 25065/39.)*

September 27th. State Rivers and Water Supply Commission. One slip-ring induction motor. (T. 25131/1939.)*

August 22nd. Underground cables. (T. 24932/39.)*

September 12th. Telephone equipment, comprising filters, indicators, terminal equipment, loading coils, &c. (T. 25398/39.)*

August 21st. Electricity Department. Control cable. (T. 25388/1939.)*

BRISBANE.—September 12th. City Electric Light Co., Ltd. Four 750-kVA transformers. (T. 25376/39.)*

VICTORIA.—August 22nd. State Electricity Commission. Porcelain insulators. (T. 25358/39.)*

Ayr.—August 21st. County Council. Electrical work for reconstruction of Ardrossan police station and two houses. Schedules from county architect.

Birmingham.—September 8th. Electric Supply Department. One 12-panel, 11,000-V, 250-kVA duplicate busbar metal-clad switchboard. Coal-handling plant and ash-disposal plant at Hams Hall "B" power station. (See this issue.)

Bootle.—August 12th. Borough Council. Colour-corrected mercury discharge lamps, lanterns, control equipment, time switches, tubular steel poles, brackets and cables. (July 28th.)

Conway.—August 14th. Borough Council. One electric vehicle. (August 4th.)

Derby.—September 11th. Corporation. Automatic vehicular traffic control signals at junction of Friargate, Ford Street and Stafford Street. (August 4th.)

Dewsbury.—August 25th. Electricity Department. Two outdoor 10,500-V, 5,000-kVA reactors. (See this issue.)

Dundee.—August 16th. Electricity Department. High- and low-voltage, p.i., lead-covered cables. (July 28th.)

East Grinstead.—August 16th. Electricity Undertaking. Fire extinguishing plant in the high-voltage switch room of the main sub-station. (August 4th.)

Edinburgh.—August 19th. Corporation. Installation of an electric goods lift at Slaughter House, Gorgie. Town clerk.

Gravesend.—August 14th. Electricity Department. One 750-kVA transformer and e.h.v. switchgear. (July 28th.)

India.—SIMLA.—August 22nd. Indian Stores Department. One 10-kW, 222/230-V, DC generating set. (T. 25273/39.)*

Iraq.—BAGDAD.—October 24th. Central Foreign Purchasing Board. Underground cables and accessories. (T. 25439/39.)*

Leeds.—Incorporated Association of Electric Power Companies. Electric clocks. (See this issue.)

Lincoln.—August 28th. North Lindsey Water Board. Pilot cable from Scotney Farm and Winterton Holmes to Sawcliffe Reservoir. (See this issue.)

Lochgelly (FIFE).—August 25th. Town Council. Twenty steel lamp standards, lamp brackets and fittings and electric lamps for street lighting installation. Town Clerk.

London.—H.M. OFFICE OF WORKS.—August 23rd. Propeller type electric fans. (August 4th.)

August 17th. Electric wire and cable. (August 4th.)

August 24th. Steel conduits and fittings for electric wiring. (See this issue.)

August 25th. Switchboards and cables at the National Physical Laboratory, Teddington. (See this issue.)

ISLINGTON.—September 13th. Borough Council. One 1,500-kVA and one 5,000-kVA Scott connected transformer. (August 4th.)

SOUTHWARK. — August 21st. Borough Council. Electric lighting and power installations at new baths, Borough High Street. (August 4th.)

Newcastle-on-Tyne. — Tyne Improvement Commission. Electrical apparatus, transformers and underground cable, including lighting and heating of two 5,500-V static sub-stations at Tyne Dock. A. Blacklock, secretary, Bewick Street.

New Zealand.—WELLINGTON.—September 26th. Public Works Department. One thirty-ton overhead travelling crane for Henderson sub-station. (T. 25128/1939.)*

September 19th. Two three-phase oil circuit-breakers, each having a rupturing capacity of 250,000 kVA at 33-kV, complete with accessories. (T. 25365/39.)*

October 3rd. Four single-phase potential transformers. (T. 25363/39.)*

October 17th. 50-kV outdoor switchgear and steelwork, complete with all necessary insulators and accessories for Maungatapere sub-station. (T. 25364/39.)*

October 24th. Mimic bus control panels complete with steel frames, panel fixing bolts, labels, instruments, control switches, indicators and terminal boards. (T. 25360/39.)*

Northallerton.—North Riding County Council. Installation of electric lighting and power at the new Northallerton senior school. Plans by the County Architect, County Hall.

Plymouth.—August 25th. City Council. Stores, including electrical installation materials. (See this issue.)

Scunthorpe. — September 4th. Electricity Department. One sheet-steel kiosk. (August 4th.)

South Africa. — JOHANNESBURG. — August 31st. Union Tenders and Supplies Board. One 50-kVA transformer and high- and low-voltage switchgear. (T. 25350/39.)*

CAPE PROVINCE.—August 14th. Municipality of Swellendam. Oil engine and alternator, control panel and voltage regulators. (T. 24748/39.)*

CAPE TOWN.—August 30th. Electricity Supply Commission. Pole fittings, including line, tension and angle cross-arms, earth wire clamps and galvanised steel wire. Pin type and suspension strain insulators. (T. 25642/39.)*

Southampton. — August 29th. Electricity Department. Electrical installations at Station Road schools, Sholing. (August 4th.)

Stoke-on-Trent.—September 6th. Electrical Engineer's Department. Electric cookers, washboilers, kettles, water heaters and circulators. (August 4th.)

Sunderland.—August 28th. Electricity Undertaking. P.i. cables, v.i.r. wire, meters and electric lamps for twelve months. (August 4th.)

Tredegar.—August 21st. U.D.C. Two 250-kVA transformers. (See this issue.)

Uruguay.—MONTEVIDEO.—August 22nd. State Electricity Supply and Telephones Administration. Rubber - insulated tinned copper conductors. (T.Y. 25250/1939.)*

Walsall.—September 4th. Electric Supply Department. One 500-kW mercury-arc rectifier, one 6-panel DC switchboard and remote supervisory control equipment. (August 4th.)

August 25th. One 2,000-kVA outdoor type transformer. (August 4th.)

West Ham.—September 4th. Electricity Department. V.i.r. and tough rubber-sheathed wires and cables for twelve months. (See this issue.)

West Hartlepool.—Town Council. Installation of electric wash boilers in 116 houses and 40 bungalows on the Seaton Lane estate and 182 houses on the Dyke House estate. Plans by F. Durkin, borough engineer.

Orders Placed

Barrow-in-Furness.—Electricity Committee. Accepted. Switchgear (£1,014).—B.T.H. Co. High-voltage switch (£122).—Ferguson, Pailin. Six surge absorbers (£330).—Ferranti, Ltd. Boiler feed pump (£191).—Mather & Platt. Low-voltage board (£125).—W. Lucy & Co.

Birkenhead. — Electricity Committee. Accepted. One 450-kVA transformer and one 475-kVA transformer (£416).—G.E.C.

Dover.—Town Council. Accepted. Two 6,600-V outdoor type electricity kiosk sub-stations for St. Margaret's.—Yorkshire Switchgear Engineering Co.

Great Yarmouth.—Electricity Committee. Accepted. Soot-blowing equipment (£178).—Hopkinsons, Ltd.

Hull.—Education Committee. Accepted. Installation of electric lighting, heating and radio at Hopewell Road school (£2,668).—Arthur Lee.

Ilford.—Electricity Committee. Accepted. 6.6-kV metal-clad switchgear (£1,658).—Crompton Parkinson.

(Continued on next page)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 2nd:—

Eureka. No. 582178. Class 5 (III). Uncovered copper-nickel electrical resistance wire.—The London Electric Wire Co. and Smiths, Ltd., 24, Queen Anne's Gate, Westminster, S.W.1.

G.E.C. (lettering and design). No. 605083. Class 6 (IV). Castings (unwrought and partly wrought) of common metal.—The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Hornet. No. 606527. Class 7 (IV). Portable electrically driven tools for drilling, boring, grinding, buffing, burnishing, screw driving, nut running and similar purposes.—The Black and Decker Manufacturing Co., Towson Heights, Maryland, U.S.A. (British representatives: McKenna & Co., 31-34, Basinghall Street, E.C.2).

Dudley Electric (lettering and design). No. 605498. Class 9 (IV). Electric flat irons, branding irons, soldering irons, waffle irons, waving irons, vacuum cleaners, domestic polishing machines, dust extractors, kettles and coffee percolators.—The Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

Britex. No. 607134. Class 11 (IV). Ordinary electric lamps.—The British Home Stores, Ltd., 221-223, Baker Street, N.W.1.

Invisaflex. No. 607668. Class 11 (IV). Brackets for supporting electric lamps.—Electricity Services, Ltd., 86, Cannon Street, E.C.4.

Leeds. — Electricity Committee. Accepted. Transformers for twelve months: High-voltage.—English Electric Co. Low-voltage. — Electric Construction Co. Special types.—Transformers & Welders, Ltd.; Hackbridge Electric Construction Co.

Transport Committee. Accepted. Metal filament and traction lamps.—Nox Electric Lamp Co.

Seaham Harbour.—U.D.C. Accepted. Electric cable (£145).—Henley's.

South Shields.—Town Council. Accepted. Electrical work at the Wenlock Road School (£535); electrical installation in connection with the erection of 154 houses (£705).—A. J. Wares, Ltd.

Wolverhampton. — A.R.P. Committee. Accepted. Battery lighting installations at the Town Hall (£95) and market (£95). —Nife Batteries, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Houses (200), Penywaun, for U.D.C.; E. J. Hughes, clerk.

Aylesbury.—Houses (142), off Broughton Lane, Tring; J. Timberlake.

Bedlington.—Gymnasium at Bedlington secondary school for Northumberland C.C.; Coxon and Doherty, builders, Blyth.

Bexhill-on-Sea. — Senior school, The Down (£54,261), for E.C.; borough surveyor.

Billingham-on-Tees.—Fire station for U.D.C. (£19,250); Kitching & Co., architects, Albert Road, Middlesbrough.

Blyth.—Houses (284), North Farm estate for the T.C.; Towers & Son, builder, Union Street.

Bridgnorth.—C. of E. senior school for Managers and Salop E.C. (£33,500); W. A. Sherratt, Ltd., contractors, Beaumont Road, Church Stretton, Salop.

Bursiem.—Flats (48), and one shop, Hadderidge site (£29,917); C. Cornes & Son.

Cambridgeshire.—Senior school, Soham, for E.C.; county architect, Cambridge.

Cannock.—Senior school (£21,560); Education Committee.

Chelmsford.—Houses (34), Tyrells Close; W. M. Rollings. Enlargement of Chelmsford and Essex Hospital, London Road; Governors.

Chester.—R.C. senior school, Old Wrexham Road; Shrewsbury Diocesan Schools, Commission.

Chesterfield.—Houses (140), off Boythorpe Road, 29 houses, Callow Road, Hasland, 80 houses, Whittington Moor; W. S. Wilson, borough engineer.

Consett (Co. DURHAM). — Council offices; Lyons, Brael & Elsom, architects, London.

Dearham (CUMBERLAND). — Houses (40), for the North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne; T. Nicholson, architect, 37, Washington Street, Workington.

Dover.—Schools, Astor Avenue, and Shatterlocks, for E.C.; education architect.

Durham.—Houses on six-acre site at Shincliffe Bank Top; R.D.C. surveyor.

East Sussex.—Senior school, Heath field, for E.C.; county architect, County Hall, Lewes.

Elham.—Fire station and store building, for R.D.C.; R. Mills, building surveyor, Council Offices, Lyminge, Kent.

Failsworth.—Houses (206) in Lord Lane for Timson Estate Co., 1, Princess Street, Huddersfield; Roberts Wood & Elder, architects, 26, King Street, Manchester.

Finchley.—Houses (100), Elmshurst estate, East Finchley; Comben & Wakeling, Ltd., 603, Kenton Road, Kenton, Harrow.

Folkestone.—New police headquarters, site in West Cliff Gardens, for T.C.; borough surveyor.

Gillingham.—Houses (23), Elinfield Road; C. J. Howard.

Glasgow.—New junior department for Bellahouston secondary school (£40,000); city architect. Second development of Pollok housing estate (584 houses) (£300,000); city architect.

Gwyrfai (CAERNARVON).—Houses (37), at Rhostryfan and Cesarea; D. H. Roberts, surveyor, 22, Castle Square, Caernarvon.

Hendon.—Houses (120), Brent Hill, for T.C.; A. O. Knight, borough engineer, Town Hall, The Burroughs, N.W.4.

Hertford.—Fire station, Hertingfordbury Road (£12,000), for T.C.; borough surveyor.

Hull.—Senior school, Priory Road (£33,850); Markwell, Holmes & Hayter, Ltd. Aerodrome (£101,500); city engineer.

Ilford.—Houses (30), Havering Gardens; J. T. Perrin. Senior school (£20,000), near Seven Kings Station; T. H. B. Scott, architect, 110, Horseferry Road, London, S.W.1.

Ilkeston.—Junior school, Cavendish Street (£15,170); G. Harrison.

Inverness.—Terminal buildings for Town Council at Airport (£16,410) (offices, radio control and operating rooms, &c.); burgh surveyor.

Keswick.—Central school (£20,000), for Cumberland E.C.; county architect, Alfred Street North, Carlisle.

Leeds.—Houses (100), Belle Isle estate; city architect. Houses (14), Brianside estate (£4,975); Mark Haley & Sons. St. Vincents' Boys' Home for Homeless Boys (Bishop Cowgill's Memorial) at Bramley (£10,000) for the Trustees; P. Concoran, contractor, Cockshutt Lane, Bramley.

Leicester.—Infants' school on Checketts Road (£26,000); E. J. Williams, architect, 13, New Street.

Leyland.—Senior school at Union Lane (£22,735); W. C. Mangan, architect, Guildhall Street, Preston.

London. — (BATTERSEA). — Extensions, St. John's Hospital (£4,300); L.C.C. architect. (CHELSEA).—Development, Cadogan Avenue area (£260,000); borough engineer. (HOMERTON). — Enlargement, Eastern Hospital (£26,000); L.C.C. architect. (ISLINGTON).—Extensions to St. Mary's Hospital (£77,500); L.C.C. architect. (ROTHERHITHE).—Extensions to St. Olave's Hospital (£31,300); L.C.C. architect. (WHITECHAPEL).—Nurses' home, St. Peter's Hospital (£52,225); L.C.C. architect.

Longton (STAFFS).—Factory, Caroline Street (£3,000); Belstaff Manufacturing Co.

Luton.—Houses (26), Crescent Road and Crawley Green Road; A. Carter. Houses (10), Mossbank Avenue; H. C. Janes, Ltd.

Macclesfield. — Estate development, Manchester Road, for Gorton & Wilson; P. Wright, architect. Police Station buildings and office extension, Market Place, for Corporation Market Place Improvement Committee; M. B. Tetlow, borough architect, Pear Tree House, Jordangate. Central school, Buxton Road, for Corporation E.C.; M. B. Tetlow, borough architect.

Mansfield.—Ward block, General Hospital, West Hill Drive; Governors.

Merthyr Tydfil. — Houses (62), Treharris, for T.C.; borough surveyor.

Morden.—Houses (22). St. Helier estate (£11,235); E. Clarke & Sons.

Morpeth (NORTHUMBERLAND).—Alterations and improvements to St. James' Church; C. Franklin Murphy, architect, Lloyds Bank Chambers. Houses (120), on five sites; R.D.C. surveyor, Bridge Street.

Neath.—Houses (100), Westmoor estate (£34,650); borough engineer.

Newbury.—Houses (28), Priory Road; H. Rowlands.

North Riding.—Additions to Reeth School and new school at Beadlam for the C.C.; county architect, County Hall, Northallerton.

Northumberland.—Public air raid shelters (£162,955); W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Okehampton.—New drill hall at Sandy Park, Drewsteignton, for Territorial Army and Air Force Association.

Plymouth — Dwellings (166), Efford Section 2, for T.C.; city architect, Guildhall.

Reading.—Large extensions to stores, West Street; Reading Co-operative Society, Ltd.

Renfrew.—Houses (31), Stamperland, Clarkston; Lawrence Building Co.

Rochford. — Fire stations, Hockley, Rochford and Great Wakering; R.D.C. surveyor.

Rugby.—Houses (70), Chapel estate, Hillmorton, for R. Gardner & Son.

Sale.—Houses (26), Beech Farm; 14 houses, Dumber Lane; 10 houses, Green Lane, for the T.C.; D. Cooper, contractor, Clarence Street, Warrington.

St. Albans.—Houses (100), Cottonmill estate (£35,410); borough engineer.

St. Faith's.—Houses (41), various sites, for R.D.C.; E. R. Larner, housing surveyor, Tudor Hall, Rose Lane, Norwich.

Seaton Valley (NORTHUMBERLAND).—Houses (220), at Seghill; surveyor, Council Offices, Seaton Delaval.

Sheffield.—Houses (24) off Gleadless Common; C. Redmile. Bus station, Pond Street (£12,000); city architect. Houses (20), Norton Park Road; R. Wallace.

Skibbereen.—Houses (30), High Street, for U.D.C.; B. O'Flynn & Son, architects, 60, South Mall, Cork.

Slough.—Houses (268), Council estates (£101,750); borough engineer.

South Benfleet.—Large extensions to factory, Lambert Road, for Glanfield & Son, Ltd.; P. G. Hayward, architect, 51, High Street, Southend-on-Sea.

South Kesteven.—Houses (61), various parishes (£21,425); R.D.C. surveyor.

South Shields.—Additional accommodation at the General Hospital for the T.C. (£13,899); G. Henderson, builder, East Boldon. Houses (215) and a block of shops with air-raid shelters under shops, for Town Council; J. Reid, borough engineer, Town Hall.

Stretford — Houses (40), Highfield estate; H. T. Seward, architect.

Stroud.—Houses (62), Uplands estate (£30,880); U.D.C. surveyor.

Sunderland.—Elementary schools; Matkin & Hawkins, architects, Barclays Bank Chambers.

Thornliebank. — Cinema and shop, junction of Spiersbridge Road and Lochiel Terrace; Thornliebank Cinema Co.

Tolworth.—Factory and laboratories, adjoining Kingston By-pass Road; T. B. Andree Rubber Co., Ltd., Hook Rise.

Torquay. — Houses (32), Teignmouth Road; C. H. Hackings. Health centre (£9,640); borough engineer.

Wakefield.—Houses (18), May Bush Road; Kay & Lunan.

Wallsend-on-Tyne.—Houses (220), and 100 bungalows, for Town Council: J. Blench, borough engineer, Town Hall.

Warrington.—Houses (93), off Hayle Street, and 7 houses in George Street. Warrington; L. Livesey, builder, 54, Dover Road, Southport.

Warwick.—Factory, Millers Road, for J. P. Filhol, Morrell Street, Leamington Spa; F. Heynes, architect, 15, The Parade, Leamington Spa.

Wellington (SALOP). — Houses (56). Donnington Barracks site, for R.D.C.; James Hickman & Sons, architects. Houses (108), Mannerley and Rock estates (£44,592); R.D.C. surveyor.

Witney.—Houses (81). Carterton, Oxon, for R.D.C.: F. Russell Cox, architect, The Blanket Hall.

Wolverhampton.—Extensions, Bingley Street school (£12,236): J. F. Hughes, Ltd. Houses (14), Finchfield Lane; Bushbury Estates Co. Houses (20), off Beech Road; Brookes & Son. Houses (46), Fordhouse Road; L. C. Lymer.

Wrexham. — Houses (78), various parishes (£27,145); R.D.C. surveyor.